KENNY BOILER and MANUFACTURING CO.

KENNY
QUALITY PRODUCTS
ST. PAUL. MINN.

SAINT PAUL, MINNESOTA

KENNY BOILERS

BOILERS, TANKS, STACKS
Heating and Power Plant Accessories

KENNY
QUALITY PRODUCTS

KENNY BOILER AND MANUFACTURING CO.

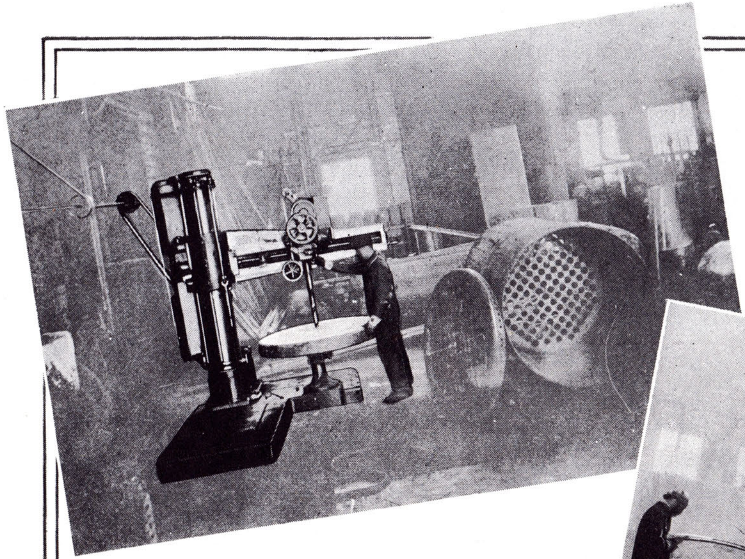
SAINT PAUL, MINNESOTA

Two Views in Our Plant

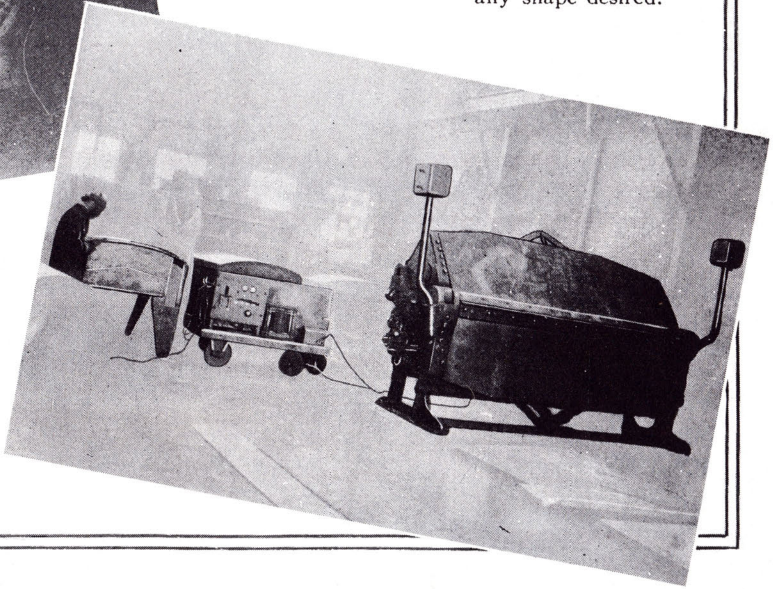
(Left)—Mammoth drill capable of drilling any size hole in steel or cast iron.

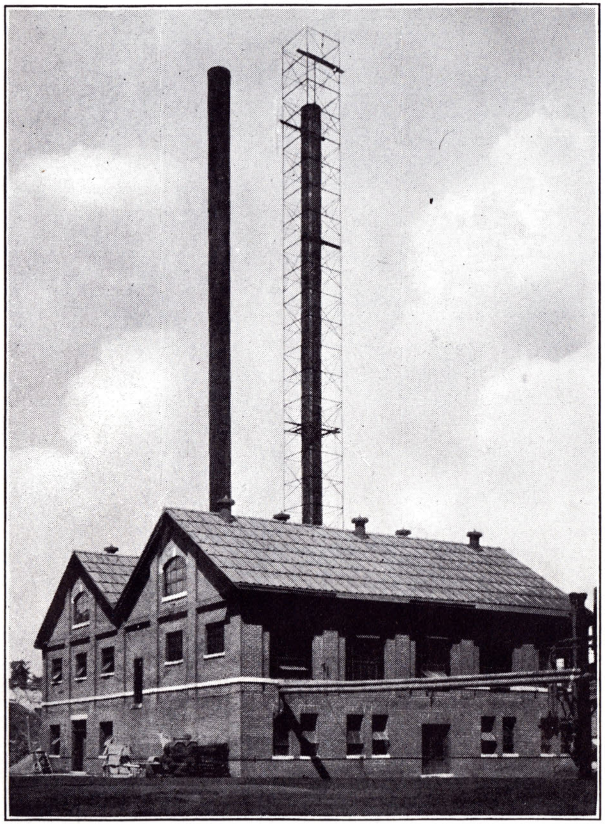
(Below right)—Portable Electric Welding Machine. We are prepared to do both electric and oxacetylene welding anywhere.

(Below left)—This Power Brake will form steel sheets and plates into any shape desired.



Keeping our plant equipped with new and up-to-date machinery is one factor that enables us to uphold our reputation throughout the Northwest as producers of high quality heat, power and pressure equipment.





Stacks built and erected by us for
Northern States Power Co.

THE name "Kenny" on Boilers, Tanks, Stacks, Heat and Power Equipment and Steel Products has for years meant quality of workmanship and reliability in operation.

Operating a plant in which the most modern machinery is manned by expert mechanics, we are in a position to manufacture our products in accordance with approved modern methods at prices commensurate with good quality and fine workmanship.

In addition we are constantly striving to increase the value of our organization to our customers, by rendering prompt and efficient service in deliveries, installations and repairs.

Let us talk over your next problem with you.

Foreword

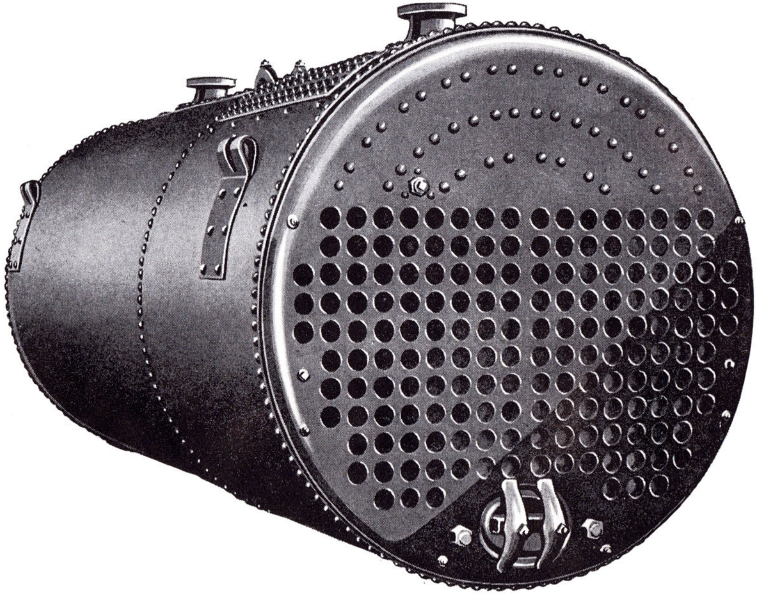
While the primary purpose of this catalog is to describe and illustrate fully the various items we regularly manufacture and carry in stock for the immediate requirements of our customers, the nature of our plant and machinery is such that it lends itself to the manufacture of many other items which are not shown here.

If at any time you have a problem which entails the fabrication of light or heavy metals we will welcome an opportunity to confer with you in regard to them.

In addition you will find herein many tables and charts of information which we hope you will find useful.

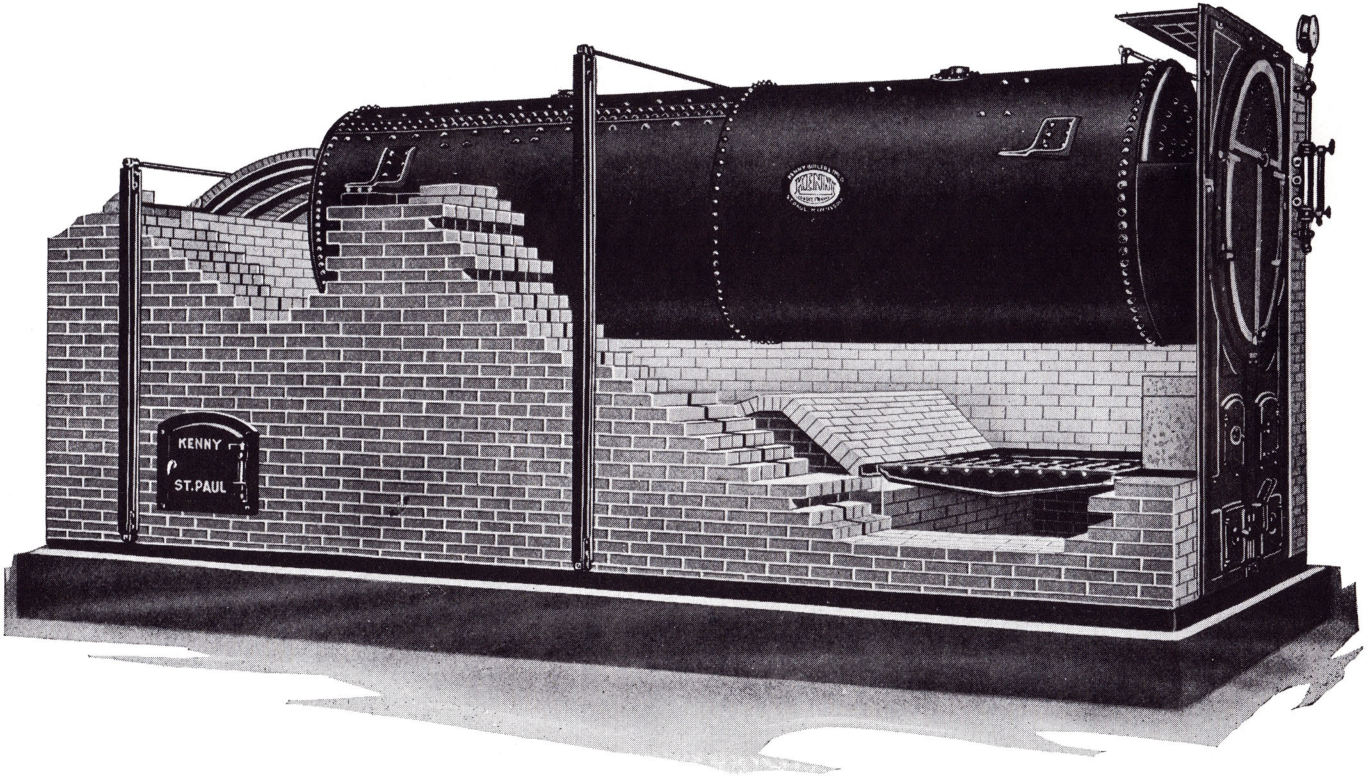
KENNY BOILER *and* MANUFACTURING CO.
SAINT PAUL, MINNESOTA

Kenny Horizontal Tubular Boiler



Made for any working pressure with 3, 3½ and 4-inch tubes.

Kenny Horizontal Tubular Boiler



Showing full front setting and details of masonry

Specifications of Kenny Horizontal Tubular Boilers

For 100 Pounds Working Pressure

SPECIFICATIONS

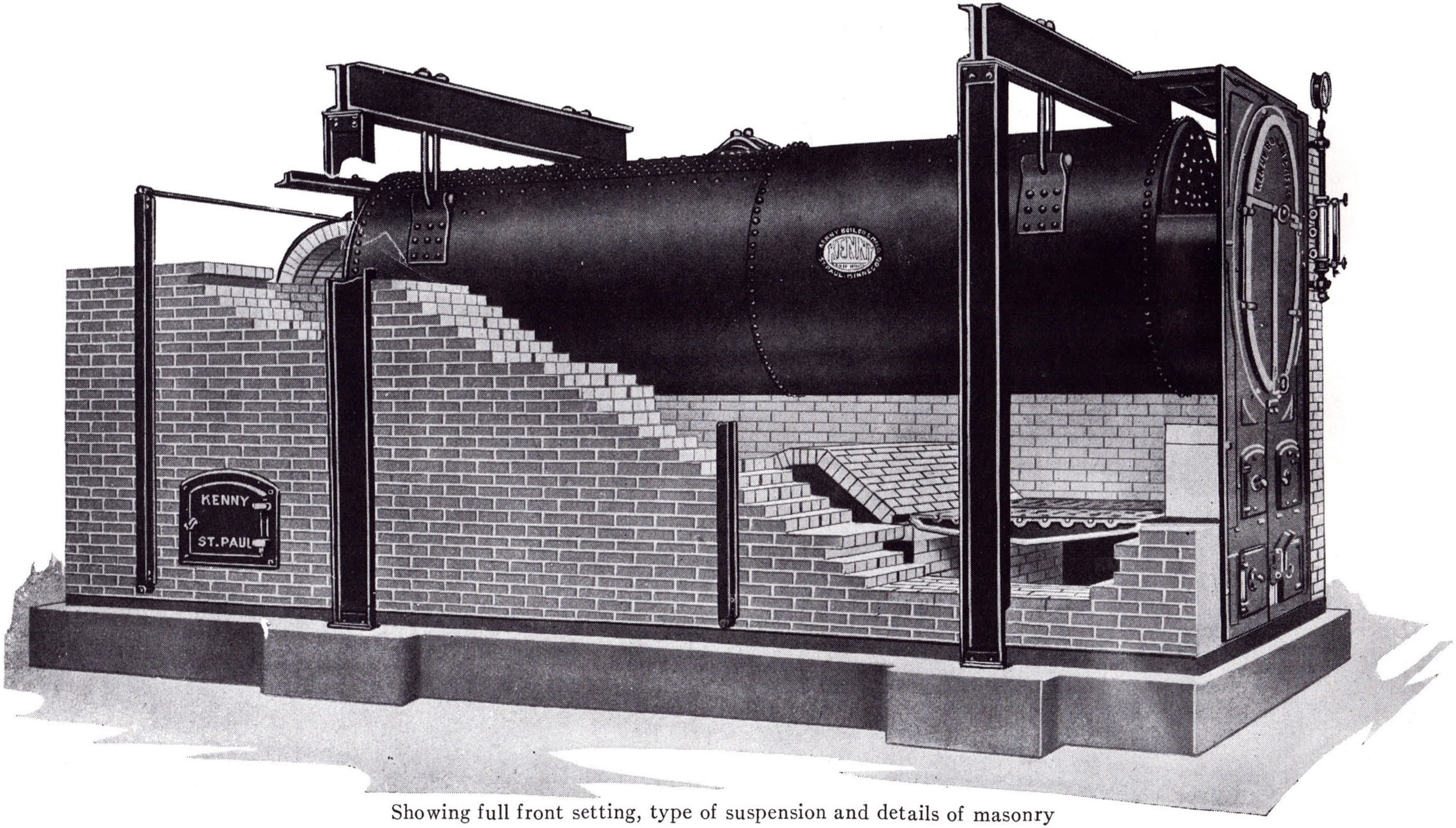
	Horse Powet A. S. M. E.	17	20	20	25	30	35	40	45	50	55	60	70	75	90	100	110	120	140	155
	Dimensions	30x8	30x10	36x8	36x10	36x12	42x10	42x12	42x14	48x12	48x14	48x16	54x14	54x16	60x16	60x18	66x16	66x18	72x16	72x18
	Shell Heating Surface	41	48	50	63	75	74	86	98	101	117	133	132	151	168	189	184	207	201	226
3″ Tubes	Number	**20**	**20**	**24**	**24**	**24**	**34**	**34**	**34**	**46**	46									
	Tube Heating Surface	**126**	**157**	**151**	**189**	**226**	**271**	**321**	**373**	**434**	506									
	Total Heating Surface	**167**	**205**	**201**	**252**	**301**	**345**	**407**	**471**	**535**	623									
	Steam Radiation, Sq. Ft.	**1200**	**1500**	**1500**	**1900**	**2200**	**2600**	**3100**	**3600**	**4100**	**4800**									
3½″ Tubes	Number									34	**34**	34	**44**	44	54	54	66	66	**86**	**70**
	Tube Heating Surface									374	**436**	498	**564**	645	792	891	968	1089	1261	**1418**
	Total Heating Surface									475	**553**	631	**696**	796	960	1080	1152	1296	1462	**1644**
	Steam Radiation, Sq. Ft.									3600	**4300**	4900	**5500**	6300	7800	9000	10000	12000	14000	15000
4″ Tubes	Number										28	**28**	36	**36**	**44**	**44**	**45**	**54**	**70**	**70**
	Tube Heating Surface										411	**470**	528	**603**	**737**	**829**	**905**	**1018**	**1173**	**1320**
	Total Heating Surface										528	**603**	660	**754**	**905**	**1018**	**1089**	**1225**	**1374**	**1546**
	Steam Radiation, Sq. Ft.										4100	**4700**	5200	**6000**	**7400**	**8500**	**9200**	**11000**	**13000**	**15000**
	Thickness Shell	¼	¼	¼	¼	¼	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	⅜	⅜	⅜	⅜	7/16	7/16
	Thickness Heads	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	7/16	7/16	7/16	7/16	7/16	½	½	½	½	9/16	9/16
	Steam Opening, front ... Inches	4	4	4	4	4	5	5	5	6	6	6	6	6	6	6	6	6	6	6
	Safety Valve Opening, rear ... Inches	2	2	2½	2½	2½	2½	2½	3	4	4	4	5	5	6	6	6	6	6	6
	Blow-off Opening ... Inches	2	2	2	2	2	2	2	2	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½
	Blow-off Valve ... Inches	2	2	2	2	2	2	2	2	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½
	Water Column Connections ... Inches	1	1	1	1	1	1	1	1	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼
	Pop Safety Valve, for 100 lbs. ... Inches	1	1	1	1¼	1½	1½	2	2	2–1¼	2–1½	2–1½	2–1½	2–1½	2–2	2–2	2–2	2–2½	2–2½	2–2½
	Water Gauge ... Inches	½	½	½	½	½	½	½	½	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾
	Steam Gauge ... Inches	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	8½	8½	8½	8½
	Gauge Cocks	½	½	½	½	½	½	½	½	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾
	Check and Stop Valves	1	1	1	1	1	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1½	1½	1½	1½	1½
Stack	Gauge	16	16	16	16	16	16	16	16	16	16	16	16	16	14	14	14	14	14	14
	One Boiler	14x30	14x35	16x30	16x35	16x40	20x35	20x40	20x50	24x40	24x50	24x60	26x50	26x60	28x60	28x60	30x60	30x60	34x60	34x70
	Grates—Size ... Inches	30x30	30x30	36x36	36x36	36x42	42x36	42x42	42x48	48x42	48x48	48x48	54x48	54x54	60x54	60x60	66x54	66x60	72x54	72x60

Boilers with tube setting in heavy type are our standard and always furnished this way, unless otherwise specified.

Fronts:—Boilers 42 inches diameter and smaller have single fire and ash doors; larger, two fire and two ash doors.

Manholes:—30 inch diameter boilers have two 4x6 handholes, one in each head; 36 inch diameter boilers have one 8½x14½ manhole above tubes in rear head and one 4x6 handhole in front head below tubes; 42 inch diameter boilers have one 11x15 manhole in top of shell and one 4x6 handhole in front head below tubes; 48 inch diameter boilers and larger, have two 11x15 manholes, one in the front head below tubes and one in the shell on top.

Kenny High Pressure Horizontal Tubular Boiler



Showing full front setting, type of suspension and details of masonry

Description of Kenny Horizontal Tubular Boilers

For 125 and 150 Pounds Working Pressure

Kenny High Pressure Boilers have shells and heads of Open Hearth Fire-box Steel with a tensile strength of 55,000 pounds minimum and 62,000 pounds maximum per square inch of section with standards of ductility and tensile strengths in conformity with those adopted by the American Society of Mechanical Engineers.

The tubes are of best American manufacture, soft steel, seamless, standard as to gauge thickness and free from surface imperfections, and are properly expanded into holes carefully drilled and reamed to proper size.

Braces are scientifically placed and securely fastened. Crow foot braces running well back and all designed on a basis of not more than 60,000 pounds strain per square inch of section, with proper allowance for rivet hole.

Longitudinal seams are Quadruple Riveted Butt Joint Type placed well above the fire line, and the rivets are pneumatically driven into snug-fitting holes with heads formed equal in strength to the pressed head and are so placed to provide strength necessary to maintain a factor of safety of five.

While our boilers are so well riveted as to be practically tight, the caulking edges are well planed and caulking is done by round nose tools pneumatically driven.

There are two manholes in each boiler measuring 11 inches by 15 inches—one located in front head below tubes, the other in top of shell. These are fitted with pressed steel saddles, faced to give true bearing for gasket, each complete with pressed steel cover, bridge, bolt and gasket.

Each boiler has 4 heavy steel pressed lugs, two on each side to support it in the brickwork.

Steel flanges are riveted to top of boilers for steam connection and safety valve and in the rear head 2 inches above the top row of tubes the boiler is equipped with a soft metal fusible plug.

An internal feed pipe is provided entering front head on left side, 3 inches above top row of tubes through a brass bushing and extends back to within two feet of rear head, then across near right-hand side of shell with an elbow. The feed pipe is thoroughly supported by braces.

Each boiler is carefully tested to pressures far in excess of rating.

Specifications of Kenny Horizontal Tubular Boilers

For 125 and 150 Pounds Working Pressure

Without Domes—Flange Steel, 60,000 Pounds T. S., in Shell and Heads.

Horse Power	45	50	55	60	70	80	90	100	110	125	150	175	180	200	200	225
Dimensions	48x12	48x14	48x16	54x14	54x16	60x16	60x18	66x16	66x18	72x16	72x18	72x20	78x18	78x20	84x18	84x20
Number 3″ Tubes	**46**	46														
Number 3½″ Tubes	34	**34**	34	**44**	44	54	54	66	66	86	86	86	110	110	124	124
Number 4″ Tubes	28	28	**28**	36	**36**	**44**	**44**	**54**	**54**	**70**	**70**	**70**	**88**	**88**	**106**	**106**
Heating Surface 3″ Tubes	**434**															
Heating Surface 3½″ Tubes		**436**		**564**												
Heating Surface 4″ Tubes			**470**		**603**	**737**	**829**	**905**	**1018**	**1173**	**1320**	**1466**	**1659**	**1843**	**1874**	**2082**
Heating Surface Shell	**101**	**117**	**133**	**132**	**151**	**168**	**189**	**184**	**207**	**201**	**226**	**251**	**245**	**272**	**272**	**294**
Thickness Shell 125-lb. Boiler	5/16	5/16	5/16	11/32	11/32	3/8	3/8	13/32	13/32	7/16	7/16	7/16	½	½	½	½
Thickness Shell 150-lb. Boiler	11/32	11/32	11/32	3/8	3/8	13/32	13/32	15/32	15/32	½	½	½	17/32	17/32	9/16	9/16
Thickness Heads 125-lb. Boiler	7/16	7/16	7/16	7/16	7/16	7/16	7/16	½	½	½	½	½	9/16	9/16	5/8	5/8
Thickness Heads 150-lb. Boiler	7/16	7/16	7/16	7/16	7/16	½	½	½	½	9/16	9/16	9/16	9/16	9/16	5/8	5/8
Two Steam Openings, each	4½	4½	4½	5	5	5	6	6	6	6	6	6	6	6	8	8
Blow-Off Valve	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½
Water Column Connections	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼
Pop Safety Valve	2	2	2	2½	2½	2½	3	3	3	4	4	4	4	4	4½	4½
Water Gauge	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾
Steam Gauge	5	5	5	5	5	8½	8½	8½	8½	8½	8½	8½	8½	8½	10	10
Gauge Cocks	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾
Check and Stop Valves	1¼	1¼	1¼	1¼	1¼	1¼	1½	1½	1½	1½	1½	1½	2	2	2	2
Stack, Gauge	16	16	16	16	16	14	14	14	14	14	14	14	12	12	10	10
Stack Size, One Boiler	24x40	24x50	24x60	26x50	26x60	28x60	28x60	30x60	30x60	34x60	34x60	34x70	38x60	38x70	42x60	42x70
Grates, Size	48x42	48x48	48x48	54x48	54x54	60x54	60x60	66x54	66x60	72x54	72x60	72x66	78x60	78x66	78x72	78x78

Riveting:—Boilers for 125 pounds working pressure, triple riveted, butt joint. Boilers for 150 pounds working pressure, quadruple riveted, butt joint. Figured to maintain factor of safety of five.

Braces:—Based on 6,000 pounds fibre stress.

Manholes:—All boilers have 11x15-inch flanged manhole under tubes in front head and in top of shell, except 48-inch which has 8½x14½-inch under tubes.

Weights of Kenny Horizontal Tubular Boilers

For 125 and 150 Pounds Working Pressure

Horse Power	45	50	55	60	70	80	90	100	110	125	150	175	180	200	200	225
Dimensions	48x12	48x14	48x16	54x14	54x16	60x16	60x18	66x16	66x18	72x16	72x18	72x20	78x18	78x20	84x18	84x20
125-lb. Boiler only—no dome	5900	6600	7100	8300	9200	11200	12400	13600	15000	16800	18400	20000	23000	25000	26000	28700
†Full Front	2000	2000	2000	2250	2250	2475	2475	2825	2825	3150	3150	3150	3350	3350	3950	3950
Grates	575	700	700	775	925	1025	1150	1125	1265	1225	1380	1450	1500	1575	1770	1950
Fire Door Arches—Cast Iron	360	360	360	360	360	360	360	360	360	445	445	445	445	445	445	445
Rear Wall Braces and Thru-Rods	210	220	230	220	230	240	250	240	250	300	375	400	400	425	425	450
Return Ribs	205	205	205	245	245	630	630	708	708	783	783	783	863	863	948	948
Clean-out Door and Frame	125	125	125	125	125	125	125	142	142	142	142	142	142	142	142	142
Stack and Guy Wire	720	900	1080	1000	1200	1620	1620	1740	1740	1980	1980	2310	2820	3290	4200	4900
Steam Trimmings	130	130	130	130	130	140	140	150	150	180	180	180	190	190	225	225
‡Complete Outfit—Full Front	10225	11240	11930	13405	14665	17815	19150	20890	22440	25005	26835	28860	32710	35280	38105	41710
125-lb. Boiler with Smoke Doors—no dome	6300	7000	7500	8800	9700	11800	13000	14300	15700	17600	19200	20800	23860	25860	27040	29740
Half or three-quarter Front	1230	1230	1230	1300	1300	1380	1380	1560	1560	1730	1730	1730	1780	1780	2050	2050
Grates	575	700	700	775	925	1025	1150	1125	1265	1225	1380	1450	1500	1575	1770	1950
Fire Door Arches—Cast Iron	210	210	210	210	210	210	210	210	210	270	270	270	270	270	270	270
Thru-Rods and Washers	80	90	100	90	100	100	100	100	100	190	240	250	240	250	250	270
Return Ribs	205	205	205	245	245	630	630	708	708	783	783	783	863	863	948	948
Clean-out Door and Frame	125	125	125	125	125	125	125	142	142	142	142	142	142	142	142	142
Stack and Guy Wire	720	900	1080	1000	1200	1620	1620	1740	1740	1980	1980	2310	2820	3290	4200	4900
Steam Trimmings	130	130	130	130	130	140	140	150	150	180	180	180	190	190	225	225
‡Complete Outfit—Half or three-quarter Front	9575	10590	11280	12675	13935	17030	18355	20035	21575	24100	25905	27915	31665	34220	36895	40495
‡Tile Arches—Add to above	325	325	325	325	325	325	325	325	325	675	675	675	675	675	675	675
150-lb. Boiler—Add to above	400	400	450	500	600	1000	1100	1300	1400	1600	1600	1600	1000	1000	1800	2100

WEIGHTS OF EXTRAS AND CHANGES

4 Steel Buck Bars and Rods	ADD	295	295	295	310	310	385	385	400	400	465	465	465	490	490	540	540
4 Wall Plates and Rollers		50	50	50	50	50	50	50	100	100	100	100	100	125	125	125	125
Dry Pipe		100	100	100	100	100	150	150	150	150	150	150	150	150	150	150	150
Thicker Shell—per 1/32-inch		275	300	325	325	350	400	450	450	500	500	550	600	600	650	625	675
Thicker Heads—per 1/16-inch		85	85	85	100	100	125	125	150	150	175	175	175	210	210	250	250

WEIGHTS OF SUSPENSION

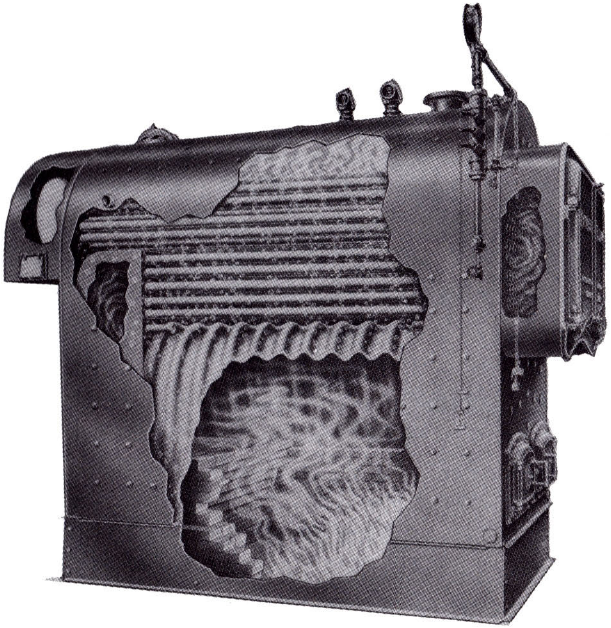
Suspension	One Boiler	1100	1100	1230	1280	1280	1690	1830	2160	2160	2300	2300	2920	3080	4240	4490	4490
	Two Boilers	2100	2210	2210	2490	2490	3150	3690	4160	4160	4810	4810	6070	6430	6430	7910	8680
	Three Boilers	3950	3950	3950	4330	4330	5940	5940	8040	8040	9160	9160	10250	11000	11730	14100	14100

†Full Front includes Front and Rear Bearing Bars, Damper and Frame, Smoke Ring and Doors. §Half or Three-Quarter Front includes Front and Rear Bearing Bars, but no Smoke Ring nor Damper and Frame.

Regular outfit consists of boiler with front (doors attached) and anchors, cast iron or fire-door arches, front and rear bearing bars, tupper or common grates, return ribs, clean-out door and frame, two cast iron rear wall braces with rods; trimmings, consisting of water column, water gauge and glass, three gauge cocks, steam gauge, safety valve, check and stop valves and blow-off valve.

Damper plate and frame are regularly furnished with full front. Rocking Grates are furnished only at an extra price. Fire tools consisting of hoe, poker and slice bar, weighing about 50 pounds, are extra. Four side wall buckbars per setting and rods are furnished when specified at an extra price.

Guy wire as follows: Stacks up to 60 feet high, six times length of stack; 60 feet and over, ten times length of stack; ¼-inch for stacks 24 inches and 26 inches in diameter; 5/16-inch for 28, 30 and 34-inch and ⅜-inch for 38-inch and 42-inch diameter stacks.



Type "C" Boilers

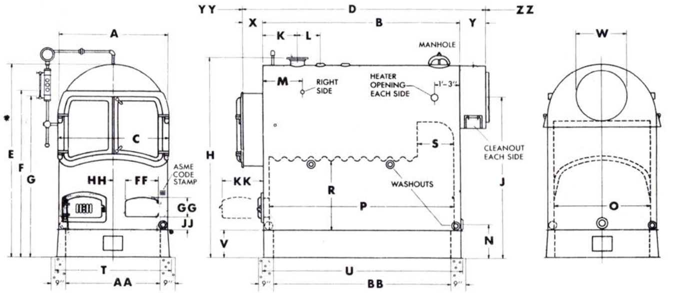
LOW PRESSURE OIL, GAS OR STOKER

15 Psi Steam, or 30 Psi Water 250° F

876,000 to 10,200,000 Btuh

Type "C" boilers are among America's most popular for heating medium to large size buildings. Dependable, fast steaming and efficient, these compact, all-welded firebox boilers will perform for years on end with only a minimum of service or attention. Adaptable to front or rear firing, this versatile boiler fits most any boiler room setting.

Type "C" Boilers LOW PRESSURE OIL, GAS OR STOKER



RATINGS • MECHANICALLY FIRED—OIL, GAS OR STOKER

Boiler Number	7L75	7L76	7L77	7L78	7L79	7L80	7L81	7L82	7L83	7L84	7L85	7L86	7L87	7L88	7L89	7L90
SBI rating — steam.........sq ft	3650	4250	4860	5470	6080	7290	8500	10330	12150	15180	18220	21250	24290	30360	36430	42500
— water ....sq ft	5840	6800	7770	8750	9720	11660	13600	16520	19440	24280	29150	34000	38860	48570	58280	68000
— MBtuh	876	1020	1166	1313	1459	1750	2040	2479	2916	3643	4373	5100	5830	7286	8743	10200
— steam per hour—212° F...lb	900	1050	1200	1350	1520	1790	2100	2550	3000	3760	4490	5240	6000	7490	9000	10490
SBI net rating — steam.....sq ft	3000	3500	4000	4500	5000	6000	7000	8500	10000	12500	15000	17500	20000	25000	30000	35000
— water ....sq ft	4800	5600	6400	7200	8000	9600	11200	13600	16000	20000	24000	28000	32000	40000	48000	56000
— MBtuh	720	840	960	1080	1200	1440	1680	2040	2400	3000	3600	4200	4800	6000	7200	8400
*firing rate — oil** ....gph	11	13	15	16	18	22	26	31	37	46	54	64	73	91	110	127
— gas ....MBtuh	1640	1910	2180	2460	2740	3280	3830	4650	5460	6840	8200	9560	10920	13670	16400	19120
— stoker***..lb per hr	146	170	195	218	244	291	340	412	485	607	729	850	972	1215	1457	1700
heating surface (SBI min)...sq ft	215	250	286	322	358	429	500	608	715	893	1072	1250	1429	1786	2143	2500
furnace volume (SBI min)...cu ft	26.1	30.4	34.8	39.1	43.5	52.1	60.8	73.8	86.8	108.5	130.2	151.8	173.5	216.9	260.3	303.6
furnace height (SBI min)...ft-in.	2-5½	2-6	2-6½	2-7¼	2-7¾	2-8¾	2-10	2-11½	3-1½	3-4¼	3-7	3-10	4-0¾	4-6½	5-0½	5-6
firebox volume above mud ring.cu ft	31.0	35.9	44.0	48.7	53.1	67.4	77.8	90.5	104.4	129.4	168.4	193.7	218.3	302.2	377.4	433.1
safety valve capacity.lb steam per hr	1314	1530	1749	1969	2188	2625	3060	3718	4374	5464	6559	7650	8745	10929	13114	15300

*Firing rates calculated to develop boiler output of 150% of SBI rating.

**Based on 150,000 Btu oil.

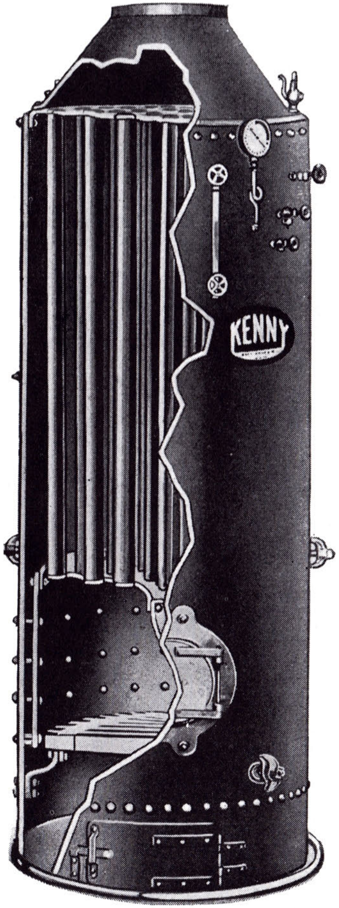
***Based on 12,000 Btu coal.

Standard equipment — Fire and insulated front flue doors with frames, rear steel smoke-box with cleanout doors, metal base. Flue cleaner and handle, washout plug wrench with extra set of gaskets. Manhole on 7L82 and larger.

Standard steam trimmings — Safety valve(s), steam gage with siphon and cock, Kewanee water column with water gage and try cocks assembly — chain operated on 7L86 and larger.

Standard water trimmings — Relief valves, or relief valves and safety valves as required by ASME Code for low pressure boilers.

Equipment shown subject to change without notice.



With Full Length Tubes

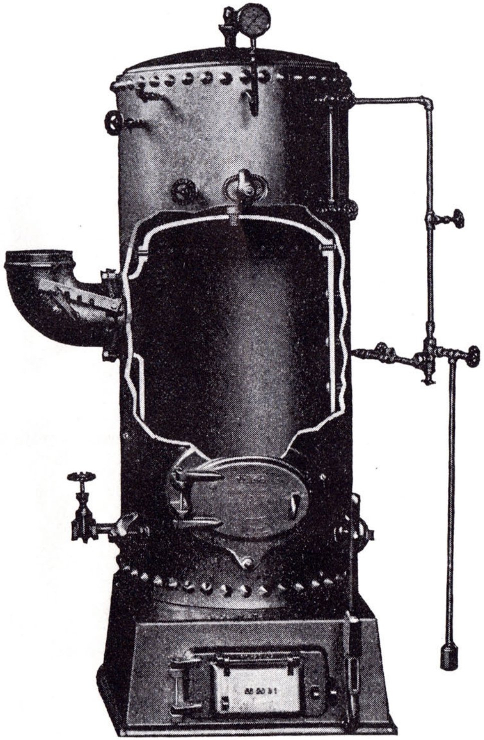
Specifications of Kenny Vertical Tubular Boilers

100 Pounds Working Pressure

FULL LENGTH TUBES

Horse Power	5	6	8	10	15	20	25	30	35	40	45	50
Diameter Shell Inches	24	24	30	30	36	36	42	42	42	48	48	48
Height Boiler “	57	63	60	75	75	93	87	93	105	96	108	120
Height over all “	65	71	68	83	83	101	95	101	113	104	116	128
Thickness Shell Inches	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	9/32	9/32	9/32
Thickness Heads “	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	7/16	7/16	7/16
Thickness Fire-box “	1/4	1/4	1/4	1/4	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
Diameter Fire-box In.	19 1/2	19 1/2	26	26	31 3/8	31 3/8	36	36	36	42 3/8	42 3/8	42 3/8
Height Fire-box “	24	24	27	27	27	27	27	27	27	30	30	20
Number of 2″ Tubes	31	31	48	48	68	68	98	98	98	128	128	128
Length Tubes In.	33	39	33	48	48	66	60	66	78	66	78	90
Size Lever Safety Valve..........In.	1	1	1 1/4	1 1/4	1 1/2	2	2	2	2 1/2	3	3	3
Size Stop and Check Valve........... “	1/2	1/2	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1	1
Size Blow-off Cock “	1	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Diameter Stack Inches	12	12	14	14	16	16	18	18	18	24	24	24
Thickness Stack Gauge	16	16	16	16	16	16	16	16	16	16	16	16
Wgt. of Boiler only lbs.	1050	1100	1350	1600	2150	2400	2950	3100	3400	3950	4300	4700
Wgt. of Trimmings “	200	200	250	250	350	350	550	550	550	700	700	700
Complete Outfit lbs.	1250	1300	1600	1850	2500	2750	3500	3650	3950	4650	5000	5400

Made throughout of flange steel, 60,000 pounds tensile strength.
Fire-box and combustion chamber thoroughly stay-bolted with refund iron bolts.
Boilers have hand-holes above flue sheet and mud ring.
Boilers have the shell extended to form ash pit, and are furnished with cast iron bottom plates.
Fixtures and fittings include grates, doors, glass water gauge, steam gauge, gauge cocks, safety valve and blow-off cock, feed valve and check valve.
Boilers for higher pressure can be furnished at an extra price—also smoke stack, fire tools and injector or inspirator, with fittings and valves.



THE KENNY TUBELESS BOILER

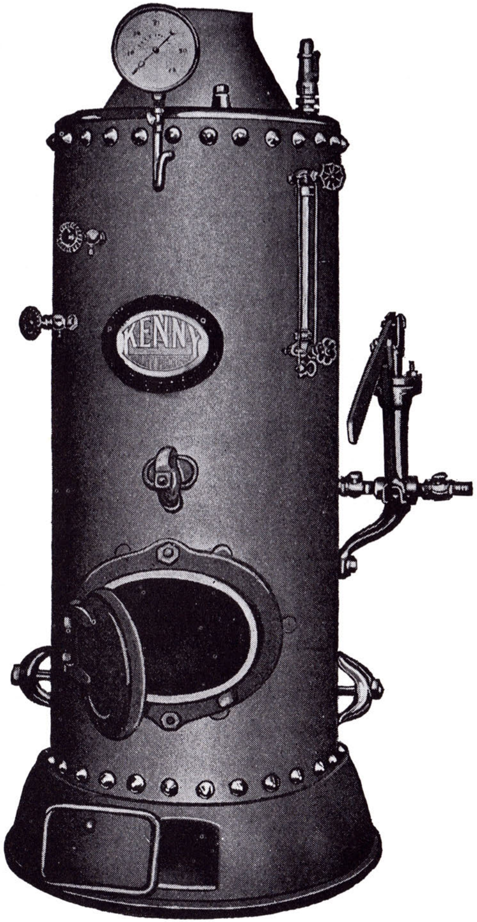
More Steam at Less Cost

No Tubes to Clean or Replace—The Best Boiler for Hard Water

SPECIFICATIONS AND SIZES

CODE WORDS	Red	White	Blue	Green	Black	Pink	Brown	Yellow	Maroon	Scarlet	Gray	Orchid
Number	1½	2	3	5	6	8	10	12	15	20	25	30
Diameter of Boiler In.	20	20	24	24	24	30	30	36	36	42	48	48
Height of Boiler “	36	42	48	56	72	72	84	72	96	96	102	120
Depth of Base “	11	11	11	11	11	12	12	10	10	10	10½	10½
Height of Boiler Overall “	47	53	59	67	83	84	96	82	106	106	113	130½
Diameter of Fire Box “	16	16	19	19	19	24	24	29½	30	36	41½	42
Height of Fire Box “	24	28	32	37	48	48	52	48	64	64	68	80
Thickness of Shell “	¼	¼	¼	¼	¼	¼	¼	¼	¼	5/16	5/16	11/32
Thickness of Fire Box “	5/16	5/16	5/16	5/16	5/16	5/16	⅜	⅜	13/32	7/16	⅜	⅜
Thickness of Top Head “	¼	¼	¼	¼	¼	¼	¼	⅜	⅜	⅜	⅜	⅜
Thickness of Fire Box Head “	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜
Size of Safety Valve “	¾	¾	¾	¾	¾	1	1	1½	1½	2	2	2
Size of Injector “	⅜	⅜	⅜	⅜	⅜	½	½	½	¾	¾	¾	¾
Size of Water Gauge “	½	½	½	½	½	½	½	½	½	½	½	½
Size of Gauge Cock “	½	½	½	½	½	½	½	½	½	½	½	½
Size of Blow Off “	¾	¾	¾	¾	¾	1	1	1	1	1	1	1¼
Size of Smoke Outlet “	6	6	6	6	6	10	10	10	10	12	12	12
Water Capacity in Gallons	17	22	32	38	55	68	88	96	130	180	230	280
Shipping Weight,	650	725	900	1075	1150	1500	1700	2000	2500	3400	4200	5000

Regular equipment furnished with Kenny Tubeless Vertical Boilers consists of: Cast iron base with sizes 30″ diameter and less, larger sizes have extended shell to form base and ash pit; cast iron smoke outlet, elbow with damper; ash door; shaking grate bars; cast iron fire door frame, door and liner; handhole plates with bolts, arches and gaskets; steam gauge and syphon; gauge cocks; water glass fittings complete; blow-off cock and nipple; pop safety valve; and injector fitted to boiler with necessary globe and check valve.



Kenny Vertical Tubular Boilers

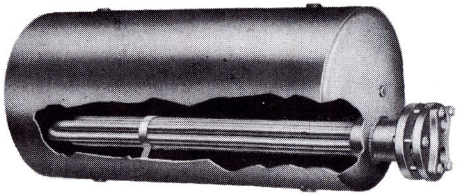
This cut represents our Cooker, built with water leg, so that the fire-box is surrounded by water like a regular vertical boiler. This size has two washout plugs at the bottom of water leg for cleaning out, and is tested to 100 lbs. cold water pressure.

Size No.	Diameter of Shell	Height of Shell	No. 2-inch Flues	Length Boiler Over All	Shipping Weight
1	19 in.	38 in.	9	52 in.	350 lbs.
2	19 in.	44 in.	13	58 in.	400 lbs.
3	19 in.	44 in.	13	58 in.	460 lbs.

The trimmings include two gauge cocks, steam gauge, two water glass cocks and glass blow-off valve, pump for supplying the boiler with water, safety valve, 2 feet, 6 inches suction hose, 3 feet steam pipe with valve to convey steam to barrel or vat for cooking feed or boiling water.

Instructions for Putting on Trimmings—When you are facing the boiler in front you will find in the top head a hole for the safety valve. A few inches lower in the shell and a little to the left of the door are two holes near together, one above the other, for two gauge cocks. On back side of boiler near the base is a hole in the shell for blow-off valve. Near the top of the boiler on right side in the shell is a hole for **the steam pipe.**

We wish to call your attention to the fact that one of the strongest points of the Kenny Cooker is that it is furnished with a force pump, so that the operator may put water in at any time without letting down steam and stopping the progress of the cooking.



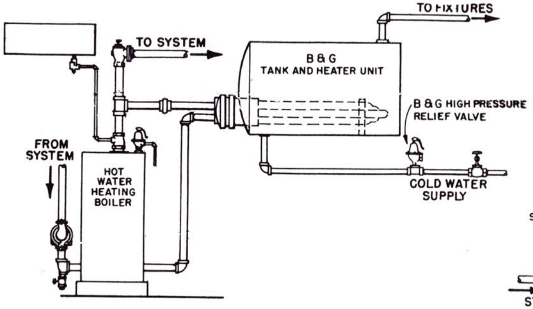
Tank and Heater Units

Complete Tank & Heater Units up to 180 gallon storage capacity can be furnished in both standard and ASME construction.

CAPACITIES AND DIMENSIONS

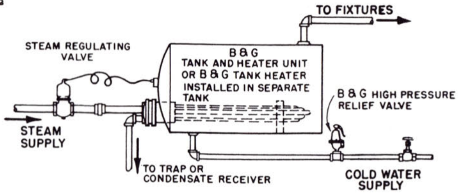
Unit Number		Tank Capacity Gallons	Tank Heater Installed*	Heater Capacity (GPH) 40-140°F. with 0 PSI Steam	Standard and ASME Tank Dimensions				Working Pressures		Approx. Shipping Wt. Lbs.	
Std.	ASME				Dia.	Length	Tank Openings	ASME Insp. Openings	Std.	ASME	Standard	ASME
40	6-40	40	TCW-448	250 GPH	16″	49″	6-1″	2-1½″	125 PSI	150 PSI	166	182
52	6-52	52	TCW-448	250 GPH	16″	62½″	6-1″	2-1½″	125 PSI	150 PSI	200	220
66	6-66	66	TCW-448	250 GPH	18″	61½″	6-1″	2-1½″	125 PSI	125 PSI	222	244
82	6-82	82	TCW-460	325 GPH	20″	63″	6-1½″	2-2″	125 PSI	125 PSI	240	264
100	6-100	100	TCW-460	325 GPH	22″	64″	6-1½″	2-2″	125 PSI	125 PSI	270	297
120	6-120	120	TCW-460	325 GPH	24″	65½″	6-1½″	2-2″	125 PSI	125 PSI	304	335
144	6-144	144	TCW-472	380 GPH	24″	77¼″	6-1½″	2-2″	125 PSI	125 PSI	340	374
180	6-180	180	TCW-648	640 GPH	30″	68″	6-1½″	2-2″	125 PSI	125 PSI	524	578

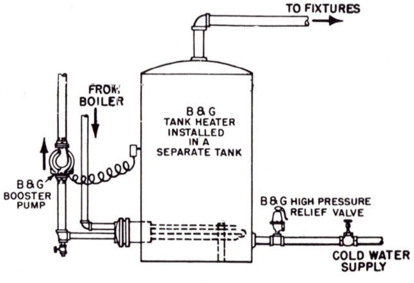
TYPICAL INSTALLATIONS — TANK AND HEATER UNITS


TO FIXTURES
TO SYSTEM
B & G
TANK AND HEATER UNIT
B & G HIGH PRESSURE
RELIEF VALVE
FROM
SYSTEM
HOT
WATER
HEATING
BOILER
COLD WATER
SUPPLY

Heating with Boiler Water —Gravity Circulation

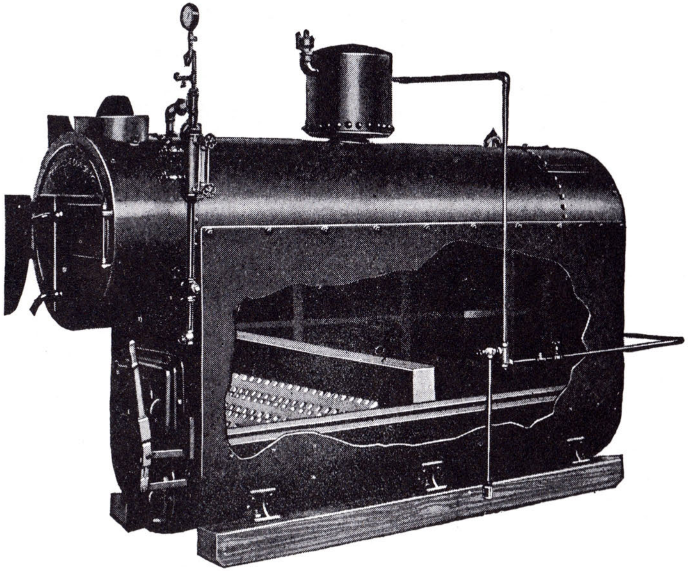
Heating with Steam


TO FIXTURES
STEAM REGULATING
VALVE
B & G
TANK AND HEATER UNIT
OR B & G TANK HEATER
INSTALLED IN SEPARATE
TANK
B & G HIGH PRESSURE
RELIEF VALVE
STEAM
SUPPLY
TO TRAP OR
CONDENSATE RECEIVER
COLD WATER
SUPPLY


TO FIXTURES
FROM
BOILER
B & G
TANK HEATER
INSTALLED
IN A
SEPARATE TANK
B & G
BOOSTER
PUMP
B & G HIGH PRESSURE
RELIEF VALVE
COLD WATER
SUPPLY

Heating with Boiler Water —Pumped Circulation

Kenny Steel Jacketed Self Contained Portable Boiler

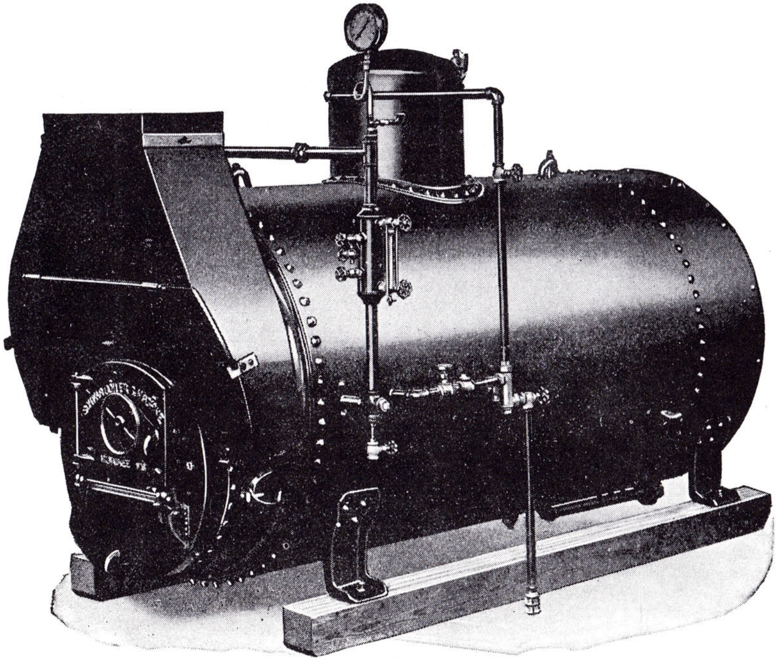


Specifications of the Kenny Steel Jacketed Self Contained Portable Boilers

Horse power rating	4	5	6	7	8	10	12	15	20	25	30	35	40	45	50
Diameter of shell, inches	26	26	26	30	30	30	30	36	36	36	36	44	44	48	48
Thickness of shell, inches	¼	¼	¼	¼	¼	¼	¼	¼	¼	¼	¼	5/16	5/16	5/16	5/16
Thickness of heads, inches	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	7/16	7/16	7/16	7/16
Length of tubes, feet	3	4	5	5	6	7	8	7	9	11	13	10	12	14	16
Number of 3-inch tubes	15	15	15	22	22	22	22	28	28	30	30	44	44	52	52
Length of grates, inches	26	26	26	30	30	30	30	36	36	42	42	48	48	54	54
Width of grates, inches	20	20	20	24	24	24	24	30	30	30	30	38	38	42	42
Size of blow-off valve, inches	1	1	1	1	1	1	1	1¼	1½	1½	1½	1½	1½	1½	1½
Size of safety valve, inches	1¼	1¼	1¼	1¼	1½	1½	1½	2	2	2	2	2½	2½	2½	2½
Length of stack, feet	24	24	24	24	24	24	24	24	24	26	26	40	40	50	60
Diameter of stack, inches	12	12	12	14	14	14	14	16	16	16	16	22	24	24	24
Approximate weight, complete	2400	3000	3500	4000	4540	4770	5000	6010	6600	7800	8657	9800	11000	12080	14025

We furnish the following fixtures and fittings: Smoke Box Extension, Door and Stack Saddle, Grate Bars, Bearing Bars, Bridge Wall, Fire Brick Lining, Safety Valve, Steam Gauge and Syphon, Water Column with Glass Water Gauge, two Gauge Cocks, Feed Check and Blow-off Valves, Injector fitted to boiler. The Detachable Dome enables convenient loading in box cars, as well as economy in freight charges. Anything else ordered will be charged for.

Kenny Internal Fired Scotch Marine Boiler



Specifications of Kenny Internal Fired Scotch Marine Boilers

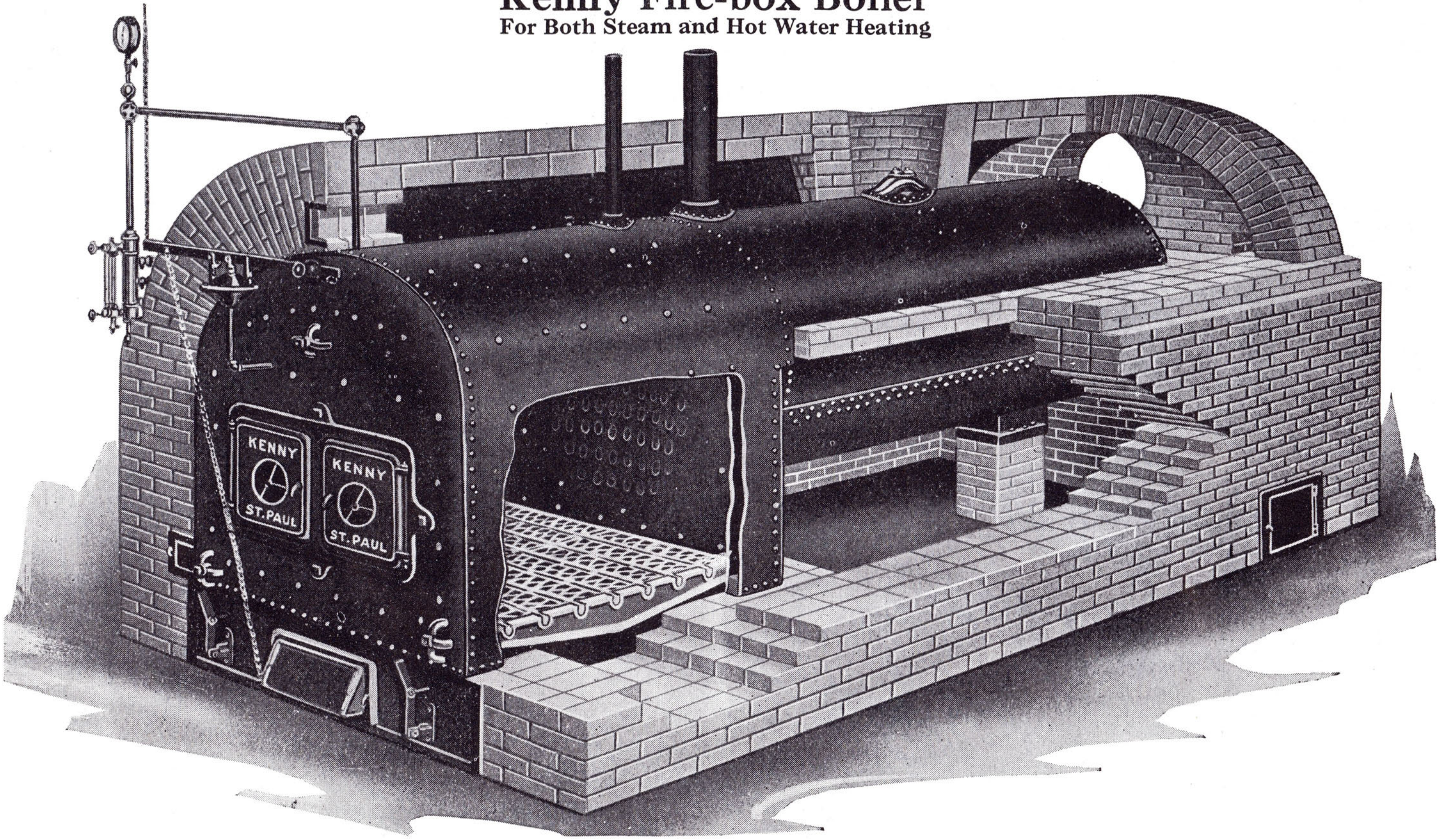
Horse power rating	6	8	10	12	15	20	25	30	35	40	50	60	75	100
Diameter shell, inches	36	36	42	42	48	48	54	54	54	54	66	72	72	78
Length shell, inches	58	76	76	85	96	102	96	108	116	133	137	137	159	180
Diameter fire-box, inches	20	20	24	24	26	26	26	26	26	26	36	36	36	36
Length fire-box, inches	43	59	58	71	78	84	78	84	92	111	115	115	135	162
Gross length fire-box, inches	30	36	36	42	48	48	48	48	48	48	60	60	60	60
Thickness of shell, inches	1/4	1/4	1/4	5/16	5/16	5/16	3/8	3/8	7/16	7/16	7/16	3/8	3/8	3/8
Thickness of heads, inches	3/8	3/8	5/16	3/8	3/8	3/8	7/16	7/16	1/2	1/2	1/2	9/16	9/16	9/16
Thickness of fire-box, inches	5/16	3/8	3/8	7/16	7/16	1/2	1/2	1/2	1/2	1/2	9/16	9/16	9/16	9/16
Number of return tubes	14	14	17	16	24	24	38	38	83	44	58	73	74	92
Diameter of return tubes, inches	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Length of return tubes, inches	43	59	58	71	74	84	78	84	92	108	110	110	132	156
Heating surface, square feet	60	80	102	119	160	176	225	248	278	373	511	605	760	1010
Diameter of stack, inches	12	12	14	14	14	14	16	16	18	18	24	24	26	28
Length of stack, feet	20	22	24	24	24	24	28	30	32	32	40	40	46	50
Width of boiler, over all, inches	40	40	43	43	49	49	42	42	42	42	48	58	58	66
Length of boiler, over all, inches	67	83	85	95	108	113	108	122	130	147	153	153	174	201
Approximate weight on skids, lbs	2800	3500	3800	4600	5900	6200	7400	7800	8300	10800	13600	15600	17900	22000

Fixtures comprise Cast Iron Front, Fire Door and Ash Pit Door together with Grates and Bridge Wall, Combination Water Column, together wirh Gauge Cocks Water Glass Fittings, Pop Safety Valve, Blow-off Valve, Injector fitted to boiler together with Check and Feed Valve.

Construction: These boilers are constructed in accordance with A. S. M. E. Code both in quality of material and workmanship for 100 pounds working pressure. If a higher pressure is wanted, an additional charge will be made.

Kenny Fire-box Boiler

For Both Steam and Hot Water Heating

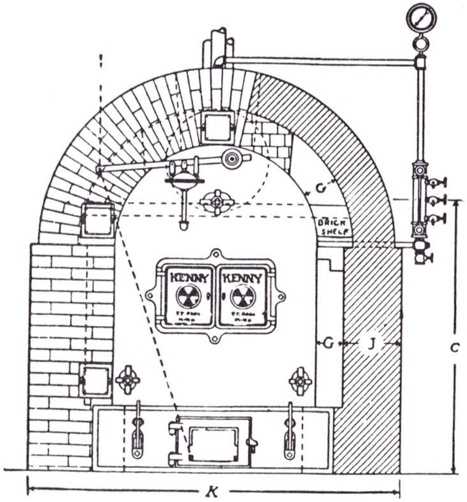

KENNY
ST. PAUL
KENNY
ST. PAUL

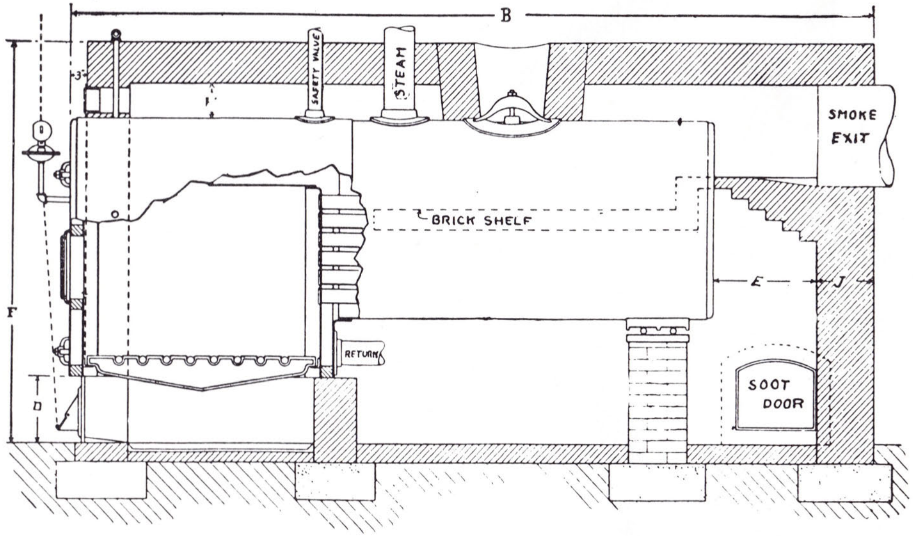
Specifications Kenny Fire-box Boilers

Flange Steel 60,000 lbs. T. S. in shell and heads. For Steam and Hot Water Heating. For Brick Setting, Without Domes. Manholes in boilers over 30 inches in diam.

Number	100	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Capacity Steam . . . sq. ft.	500	700	900	1000	1200	1400	1700	2000	2200	2500	3000	3500	4000	4500	5200	6200	7000	8500	9500	10500	11500	13000
Capacity Water . . . sq. ft.	800	1100	1500	1600	2000	2300	2800	3300	3600	4100	4900	5700	6500	7300	8500	10100	11400	14000	15500	17100	18700	21200
Diameter . . . inches	24	24	30	30	30	36	36	36	42	42	42	48	48	48	54	54	60	60	66	66	72	72
Length over all . . . feet	5½	7½	6½	7½	8½	7½	9	10½	8½	10	11½	10½	12	13½	14	16½	15½	18	16	18	16	18
Width of Fire-box . . . inches	19	19	24	24	24	30	30	30	36	36	36	42	42	42	48	48	54	54	60	60	66	66
Length of Fire-box . . . inches	20	26	26	32	38	32	38	44	38	44	50	44	50	56	56	62	62	68	62	68	68	74
Height of Fire-box . . . inches	30	30	36	36	36	41	41	41	43	43	43	47	47	47	49	49	54	54	59	59	64	64
Size of Tubes . . . inches	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4
Length of Tubes . . . inches	42	60	48	55	61	55	67	79	61	73	85	79	91	103	108	132	120	144	126	144	120	138
Number of Tubes . . .	12	12	20	20	20	29	29	29	38	38	38	48	48	48	34	34	54	54	69	69	90	90
Square Feet Fire Surface . . .	74	98	116	131	145	190	224	260	257	299	344	390	442	495	585	700	733	862	971	1097	1167	1325
Ratio Radiation to Fire Surface . . .	6.8	7.1	7.7	7.6	8.2	7.3	7.6	7.7	8.5	8.3	8.7	8.9	9.0	9.0	8.9	8.8	9.5	9.8	9.8	9.5	9.8	9.8
Square Feet of Grate . . .	2.6	3.4	4.3	5.3	6.3	6.7	8.0	9.2	9.5	11.0	12.5	12.8	14.6	16.3	18.7	20.6	22.8	25.0	25.4	28.0	30.7	33.4
Ratio Fire Surface to Grate . . .	28	29	27	25	23	28	28	28	27	27	28	30	30	30	31	34	32	34	38	39	38	40
Size of Fire Door . . Single . . . inches	10x12	10x12	12x18	12x18	12x18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18x24	18x24	18x24	18x24	18x24	18x24
Size of Fire Door . . Double . . . inches	.....	.....	.....	.....	.....	14x24	14x24	14x24	14x24	14x24	14x24	18x30	18x30	18x30	18x30	18x30	.....	.....	.....	.....	.....	.....
Diameter of Smoke-Pipe . . . inches	12	12	16	16	16	18	18	18	20	20	20	22	22	22	24	24	30	30	34	34	38	38
Size of Steam Supply . . . inches	2½	2½	3	3	4	4	4	4	6	6	6	6	6	7	7	7	7	7	8	8	8	8
Size of Return . . . inches	2	2	2½	2½	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6
Size Hot Water Flow and Return . inches	1–4	1–4	1–6	1–6	1–6	1–6	1–6	1–6	2–5	2–6	2–6	2–6	2–6	2–7	2–7	2–7	2–7	2–8	2–8	2–10	2–10	2–10
Size of Lever Safety Valve . . . inches	1¼	1¼	1½	1½	2	2	2	2	2½	2½	2½	2½	2½	3	3	3	3½	3½	3½	3½	4	4
Thickness of Shell . . . inches	¼	¼	¼	¼	¼	¼	¼	¼	¼	¼	¼	5/16	5/16	5/16	5/16	5/16	5/16	5/16	⅜	⅜	⅜	⅜
Thickness of Fire-box and Heads . inches	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	⅜	⅜	⅜	⅜	⅜	7/16	7/16	7/16	7/16	7/16	7/16
Depth of Water Leg . . . inches	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	16	16	16	16	16	16
Shipping Weight . . . pounds	1800	2200	2700	2900	3200	3700	4200	4600	4800	5400	5900	6800	7400	8100	10300	11500	14200	15600	17000	18600	19800	21600

Kenny Fire-box Boilers





Plan of setting with smoke connection at back end

Fire-box Boiler Number	100	10	11	12	13	14	15	16	17	18	19	110	111	112	113	114	115	116	117	118	119	120
Length Floor Space . . . . B	7′ 5″	9′ 5″	8′ 8″	9′ 8″	10′ 8″	9′ 8″	11′ 2″	12′ 8″	11′ 1″	12′ 7″	14′ 1″	13′ 1″	14′ 7″	16′ 1″	17′ 1″	19′ 7″	18′ 7″	21′ 1″	19′ 1″	21′ 1″	19′ 5″	21′ 5″
Width Floor Space . . . . K	4′ 6″	4′ 6″	5′ 0″	5′ 0″	5′ 0″	5′ 6″	5′ 6″	5′ 6″	6′ 0″	6′ 0″	6′ 0″	6′ 6″	6′ 6″	6′ 6″	7′ 8″	7′ 8″	8′ 2″	8′ 2″	8′ 8″	8′ 8″	9′ 2″	9′ 2″
Height of Brick Work . . . . F	64″	64″	70″	70″	70″	77″	77″	77″	83″	83″	83″	90″	90″	90″	96″	96″	108″	108″	114″	114″	120″	120″
Height of Water Line C	48″	48″	54″	54″	54″	57″	57″	57″	60″	60″	60″	64″	64″	64″	64″	64″	75″	75″	80″	80″	87″	87″
Height of Ash Pit . . . . D	14″	14″	14″	14″	14″	14″	14″	14″	14″	14″	14″	14″	14″	14″	14″	14″	17″	17″	17″	17″	17″	17″
Width of Return Space . . . . E	14″	14″	17″	17″	17″	17″	17″	17″	22″	22″	22″	22″	22″	22″	24″	24″	24″	24″	24″	24″	28″	28″
Air Space, Arch . . . . H	6″	6″	6″	6″	6″	7″	7″	7″	7″	7″	7″	8″	8″	8″	8″	8″	10″	10″	10″	10″	10″	10″
Air Space, Side . . . . G	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″	6″
Thickness of Wall . . . . J	9″	9″	9″	9″	9″	9″	9″	9″	9″	9″	9″	9″	9″	9″	13″	13″	13″	13″	13″	13″	13″	13″
Approximate Number Brick	1400	1500	1600	1700	1800	2000	2300	2400	2500	2800	3000	3200	3500	3700	5500	5700	6000	6500	6700	7100	7500	8000

N. B.—If smoke pipe is placed in front no brick shelf along side of boiler is necessary.

Increase the Efficiency of Your Plant and Cut Fuel Costs With

"85% Magnesia" Coverings

Millions of tons of coal are wasted annually through poor insulation. This waste is going on in power plants, big buildings and residences because pipes and boilers are not properly protected against the escape of heat.

"85% Magnesia" coverings not only save coal but enable you to get good steam from poor coal and practically double your steaming capacity. This is accomplished because by nature Magnesia is made up of many tiny "dead air" cells through which heat cannot escape, yet it is firm and so durable that many Magnesia coverings have been in continuous effectual use for 30 years and will ordinarily outlast the pipes and boilers it covers.

Magnesia covering saves you large sums of money yearly at any steam pressure from 5 pounds to superheat and at present coal prices returns its cost in a few months, then continues to go on saving for you.

Let us stop your heat losses by covering your boilers and steam pipes with 85% Magnesia at once.

The following table shows what we can actually accomplish for you

COAL SAVED BY "85% MAGNESIA" COVERING, 1-INCH THICK

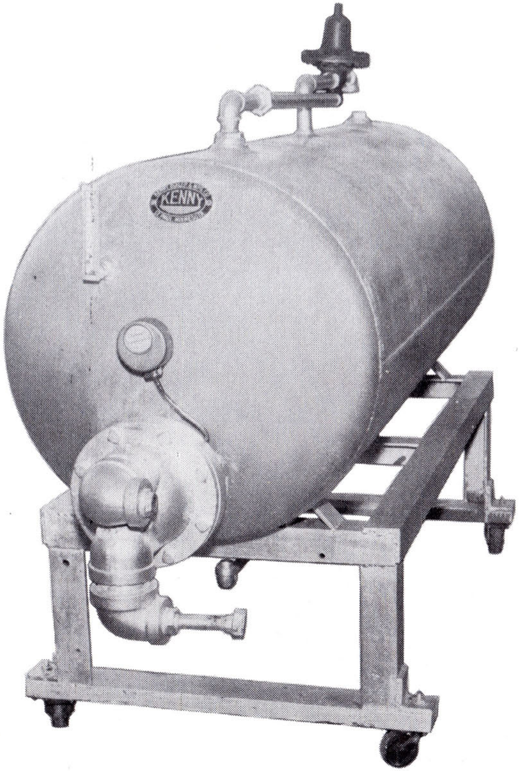
Steam Pressure	Saturated 5 Lbs.	Saturated 10 Lbs.	Saturated 50 Lbs.	Saturated 100 Lbs.	Saturated 150 Lbs.	Saturated 200 Lbs.	200 Lbs. Pressure wit 100 Degrees Superheat
Steam Temperature Deg. Fahrenheit	228	240	298	338	366	388	488
B. T. U. loss per hour per sq. ft. bare pipe	367	409	625	802	937	1058	1735
B. T. U. loss per hour per sq. ft. of pipe covered with "85% Magnesia"	69	76	105	126	142	153	210
B. T. U. saved per hour per sq. ft. by covering pipe with "85% Magnesia"	298	333	510	676	795	905	1525
Tons (2240 lbs.) coal saved per 10,000 sq. ft. per year of 8,760 hours by pipe covered with "85% Magnesia"	1190	1330	2080	2700	3180	3620	5650
Cars of coal saved per year, as above, at 40 tons per car	30	36	52	68	80	90	140

(Coal efficiency taken at 14,000 B. T. U. per lb. with boiler efficiency at 70 per cent. The B. T. U.—British Thermal Unit—is the recognized standard of heat measurement.)

These tables are based on 3-inch pipe. The savings increase with the diameter of pipe. For flat surfaces add 27 per cent to above figures. Still greater economy will be shown at pressures 100 lbs. and upwards by the use of extra thicknesses.

These tables are compiled by the Mellon Institute of Industrial Research, Pittsburgh, Pa., from tests made by its expert engineers for the Magnesia Association of America.

Kenny Steel Pressure Tanks



Size Tank	Capacity Gallons	Thickness		Regular Connections	Tapped for Water Gauge	Weight Pounds
		Shell	Heads			
24x 6	140	3-16	5-16	1¼	½x14	460
8	190	3-16	5-16	1¼	½x14	580
10	235	3-16	5-16	1¼	½x14	700
30x 6	220	3-16	5-16	1¼	½x14	607
7	258	3-16	5-16	1¼	½x14	672
8	295	3-16	5-16	1¼	½x14	737
10	365	3-16	5-16	1¼	½x14	882
12	435	3-16	5-16	1¼	½x14	1027
36x 6	315	3-16	5-16	1¼	½x22	772
7	368	3-16	5-16	1¼	½x22	856
8	420	3-16	5-16	1¼	½x22	940
10	525	3-16	5-16	1¼	½x22	1120
12	630	3-16	5-16	1¼	½x22	1284
14	735	3-16	5-16	1¼	½x22	1450
42x 8	575	1-4	3-8	1½	½x26	1475
10	720	1-4	3-8	1½	½x26	1740
12	865	1-4	3-8	1½	½x26	2000
14	1000	1-4	3-8	1½	½x26	2265
16	1150	1-4	3-8	1½	½x26	2525
48x10	940	1-4	7-16	2	½x30	2130
12	1130	1-4	7-16	2	½x30	2410
14	1300	1-4	7-16	2	½x30	2700
16	1500	1-4	7-16	2	½x30	3000
18	1700	1-4	7-16	2	½x30	3300
20	1880	1-4	7-16	2	½x30	3600
24	2260	1-4	7-16	2	½x30	4200

Tested to 125 pounds hydrostatic pressure and guaranteed for working pressures not exceeding 75 pounds to the square inch. Heads dished to a radius equal the diameter of the shell. Longitudinal seams double riveted. Furnished regularly with pressed steel flanges as shown.

Kenny Hydro-Pneumatic Tanks in stock, 24 in., 30 in. and 36 in. in diameter by 8 ft. long are tapped for use either vertical or horizontal. All others are tapped for horizontal use only.

All tanks are shipped with original test plugs, in all openngs, which insures a clean tank at destination.

Tanks 48 inches by 12 feet and smaller can be loaded for shipment in a box car.

Above sizes in stock for immediate delivery. Larger sizes quoted on application.

Kenny Standard Hot Water Tanks

For Water Storage Purposes

Size Tank	Capacity Gallons	Thickness		Weight	
		Shell	Heads	Tank Only	Coil
24x 6	140	3-16	5-16	460	88
8	190	3-16	5-16	580	110
10	235	3-16	5-16	700	132
30x 6	220	3-16	5-16	607	93
8	295	3-16	5-16	737	115
10	365	3-16	5-16	882	137
12	435	3-16	5-16	1027	159
36x 6	315	3-16	5-16	772	104
8	420	3-16	5-16	940	126
10	525	3-16	5-16	1120	148
12	630	3-16	5-16	1284	170
14	735	3-16	5-16	1450	192
42x 8	575	3-16	5-16	1131	137
10	720	3-16	5-16	1335	159
12	865	3-16	5-16	1523	181
14	1000	3-16	5-16	1710	203
16	1150	3-16	5-16	1900	225

Tested to 100 pounds hydrostatic pressure and guaranteed for working pressures not exceeding 65 pounds to the square inch. Heads dished to a radius equal to the diameter of the shell. Longitudinal seams double riveted lap joints. Furnished regularly with 2-inch pressed steel flanges at all openings, as shown. Coils are thoroughly braced in every direction. Tanks with steam coils may be successfully shipped any distance. Tanks are built to order with coils composed of four 1½-inch pipes with two stuffing boxes.

Above tanks without coils in stock for immediate delivery. Larger sizes quoted on application.

Kenny Extra Heavy Hot Water Tanks

For Water Storage Purposes

Size Tank	Capacity Gallons	Thickness		Weight	
		Shell	Heads	Tank Only	Coil
30x 6	220	1-4	3-8	810	93
8	295	1-4	3-8	1000	115
10	365	1-4	3-8	1190	137
36x 6	315	1-4	3-8	995	104
8	420	1-4	3-8	1210	126
10	525	1-4	3-8	1445	148
12	630	1-4	3-8	1675	170
42x 6	430	1-4	3-8	1210	115
8	575	1-4	3-8	1475	137
10	720	1-4	3-8	1740	159
12	865	1-4	3-8	2000	181
14	1000	1-4	3-8	2265	203
16	1150	1-4	3-8	2525	225
48x 8	750	5-16	7-16	1910	153
10	940	5-16	7-16	2400	175
12	1130	5-16	7-16	2725	197
14	1300	5-16	7-16	3085	219
16	1500	5-16	7-16	3540	241

Tested to 150 pounds hydrostatic pressure and guaranteed for working pressures not exceeding 100 pounds to the square inch. Heads dished to a radius equal to the diameter of the shell. Longitudinal seams double riveted lap joints. Furnished regularly with 2-inch pressed steel flanges as shown.

Coils are thoroughly braced in every direction. Tanks with steam coils may be successfully shipped any distance.

Tanks are built to order with coils composed of four 1½-inch pipes with two stuffing boxes.

Above tanks without coils in stock for immediate delivery. Larger sizes quoted on application.

Weights of Smoke Breechings

Diameter of Boiler Inches	Center to Center Inches	CENTER DRAFT									SIDE DRAFT Extending Two Feet Beyond Boiler Wall																
		Height, Floor to Top of Band	Dia. Stack Inches	Two Boilers			Dia. Stack Inches	Three Boilers			Diameter Inches	One Boiler					Diameter Inches	Two Boilers					Diameter Inches	Three Boilers			
				No. 12	No. 10	No. 8		No. 10	No. 8	$\frac{3}{16}$		No. 16	No. 14	No. 12	No. 10	No. 8		No. 16	No. 14	No. 12	No. 10	No. 8		No. 14	No. 12	No. 10	No. 8
36	56	9′ 7″	24	300	400	500	32	....	....	....	16	150	200	250	....	....	24	400	500	600	....	.....	32	700	1000	.....	.....
42	63	10′ 10″	28	350	500	600	34	....	....	....	20	175	225	300	....	....	28	450	600	700	850	.....	34	900	1200	1500	.....
44	63	11′ 0″	30	400	550	650	36	....	....	....	22	200	250	350	425	....	30	500	650	800	950	.....	36	1000	1350	1700	.....
48	74	13′ 0″	32	500	650	800	38	....	....	....	24	225	300	400	500	625	32	600	800	1000	1200	1400	38	1200	1600	2000	2400
54	80	14′ 0″	34	650	800	1000	42	1850	2100	2300	26	275	350	450	575	700	34	700	950	1200	1450	1700	42	1300	1800	2300	2800
60	86	15′ 4″	38	850	1050	1300	48	2000	2250	2500	28	300	400	500	650	800	38	800	1100	1400	1700	2000	48	1400	2000	2600	3200
66	92	16′ 4″	42	950	1200	1500	54	2200	2450	2700	30	....	450	600	750	900	42	....	1200	1600	2000	2400	54	1600	2300	3000	3700
72	98	17′ 9″	48	1100	1400	1700	60	2400	2700	3000	34	....	500	700	900	1100	48	....	....	1800	2300	2800	60	.....	2700	3500	4300
78	104	18′ 9″	54	1300	1650	2000	66	2700	3000	3300	38	....	....	900	1100	1400	54	....	....	....	2600	3200	66	.....	.....	4100	5000
84	110	20′ 2″	60	1500	1900	2300	72	3000	3300	3600	42	....	....	1100	1300	1650	60	....	....	....	2900	3600	72	.....	.....	4800	5800

We are prepared to furnish special breechings according to drawings and specifications.

We are prepared to make breechings of iron, instead of steel, at an extra charge.

We recommend the use of steel of the following weights:

Center Draft: No. 14 on 36, 42, 44 and 48; No. 12 on 54, 60 and 66; No. 10 on 72 and 78; No. 8 on 84.

Side Draft: One boiler—No. 16 on 36, 42, 44, 48 and 54; No. 14 on 60, 66 and 72; No. 12 on 78 and 84.

Two boilers—No. 16 on 36; No. 14 on 42, 44, 48 and 54; No. 12 on 60; No. 10 on 66, 72, 78 and 84.

Three boilers—No. 14 on 36; No. 12 on 42, 44 and 48; No. 10 on 54, 60 and 66; No. 8 on 72, 78 and 84.

Weights and Specifications of Smoke Stacks

Diameter, Inches	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	46	48	52	54	60	62	66	72
No. 16 Steel, Per Foot	9	10	12	14	15	17	18	20	22	24	....	....	....	....	....	....	....	....	....	....	....	....	....	....
No. 14 Steel, Per Foot	....	13	15	17	19	21	23	25	27	29	31	33	35	38	....	....	....	....	....	....	....	....	....	....
No. 12 Steel, Per Foot	....	....	23	25	27	29	31	33	35	37	39	41	44	47	50	53	58	60	....	....	....	....	....	....
No. 10 Steel, Per Foot	....	....	....	....	33	36	39	42	46	49	52	56	60	63	67	70	76	79	85	89	99	....	....	....
No. 8 Steel, Per Foot	....	....	....	....	....	45	49	53	57	61	65	69	73	77	81	85	93	97	105	109	121	125	133	145
3/16, or No. 7 Steel, Per Foot	....	....	....	....	....	....	58	62	67	71	76	80	85	89	94	99	108	112	121	126	140	144	153	166
¼ Steel, Per Foot	....	....	....	....	....	....	78	84	90	96	102	108	114	120	126	132	144	150	162	168	186	192	204	222
Spark Catcher, Per Foot	10	12	14	15	20	23	25	27	30	32	34	36	50	52	55	57	60	64	70	74	80	82	86	92

SPECIFICATIONS OF SMOKE STACKS FOR ONE OR MORE BOILERS

No. of Boilers	Horse Power of Boiler.	15	20	25	30	35	40	30	35	40	45	50	55	60	70	80	90	100	110	125	150	175	180	200	200	225
One	Diameter, Inches	16	16	16	20	20	20	22	22	22	24	24	24	26	26	28	28	30	30	34	34	34	38	38	42	42
	Length, Feet	30	35	40	35	40	50	35	40	50	40	50	60	50	60	60	60	60	60	60	60	70	60	70	60	70
	Gauge, Steel	16	16	16	16	16	16	16	16	16	16	16	16	16	16	14	14	14	14	14	14	14	12	12	10	10
	Weight	360	420	480	525	600	750	595	680	850	720	900	1080	1000	1200	1620	1620	1740	1740	1980	1980	2310	2820	3290	4200	4900
Two	Diameter, Inches	24	24	24	28	28	28	30	30	30	32	32	32	34	34	38	38	42	42	48	48	48	54	54	60	60
	Length, Feet	30	35	40	35	40	50	35	40	50	40	50	60	50	60	60	60	60	60	60	60	70	60	70	60	70
	Gauge, Steel	16	16	16	14	14	14	14	14	14	14	14	14	14	14	12	12	10	10	10	10	10	10	10	8	8
	Weight	540	630	720	945	1080	1350	1015	1160	1450	1240	1550	1860	1650	1980	2820	2820	4200	4200	4740	4740	5530	5340	6230	7260	8470
Three	Diameter, Inches	32	32	32	34	34	34	36	36	36	38	38	38	42	42	48	48	54	54	60	60	60	66	66	72	72
	Length, Feet	30	35	40	35	40	50	35	40	50	40	50	60	50	60	60	60	60	60	60	60	70	60	70	60	70
	Gauge, Steel	14	14	14	14	14	14	12	12	12	12	12	12	10	10	10	10	10	10	8	8	8	8	8	7	7
	Weight	930	1085	1240	1155	1320	1650	1540	1760	2200	2060	2440	2820	3500	4200	4740	4740	5340	5340	7260	7260	8470	7980	9310	9760	11420

Guy wire weighs per hundred feet as follows: ¼″, 15 lbs.; 5/16″, 25 lbs.; ⅜″, 35 lbs.
Iron can be furnished, instead of steel, at an additional charge.

Kenny Steel Stacks

The pictures on the opposite page show six typical Kenny steel stack installations.

1—St. Catherine's College

2—Crex Carpet Co.

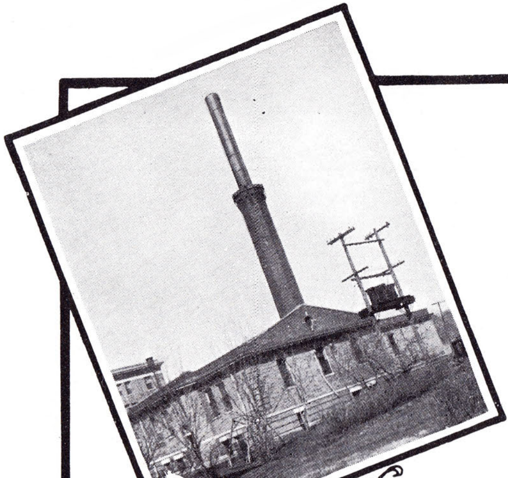
3—American Linen Supply Co.

4—American Linseed Oil Co.

5—Northern States Power Co.

6—Minnesota Valley Canning Co.

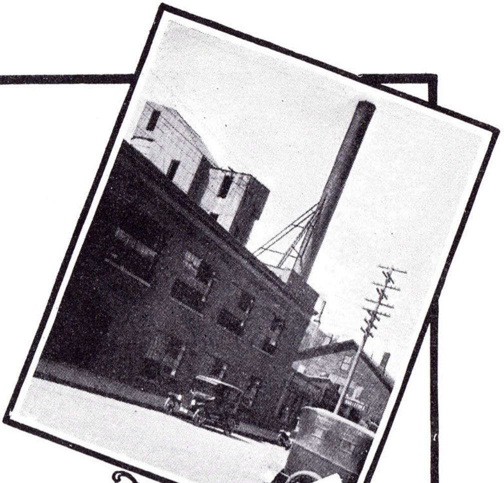
We are prepared to build stacks of any size or type and install them anywhere and will be pleased to name prices for such on receipt of specifications and particulars.



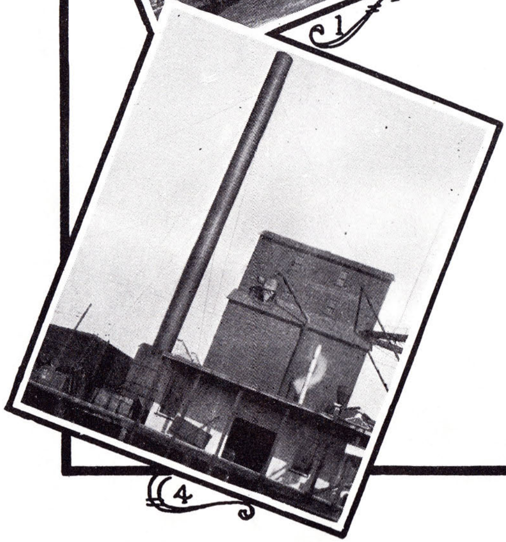
1

CREX
GRASS RUGS.
CREX
Grass Carpet
ARTISTIC DURABLE
SANITARY.

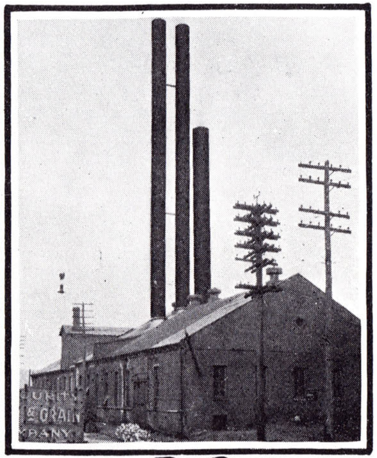
2



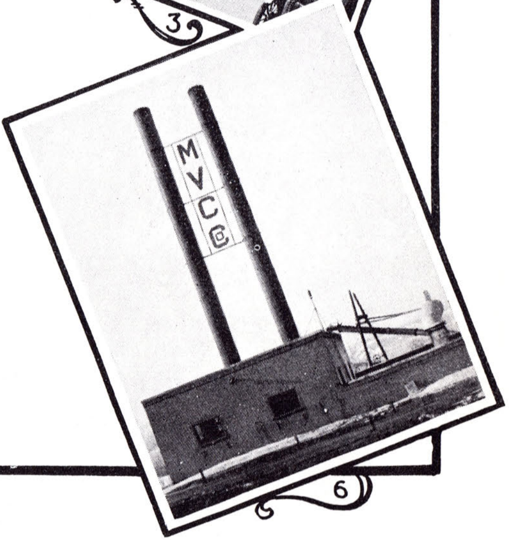
3



4

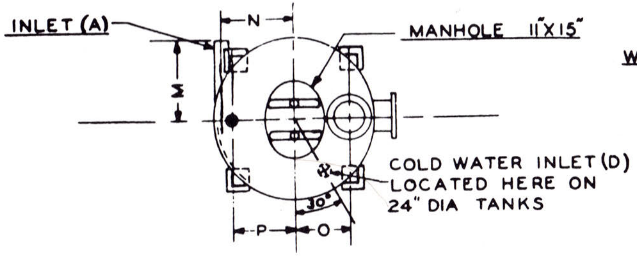

UNITY
GRAIN
PANY

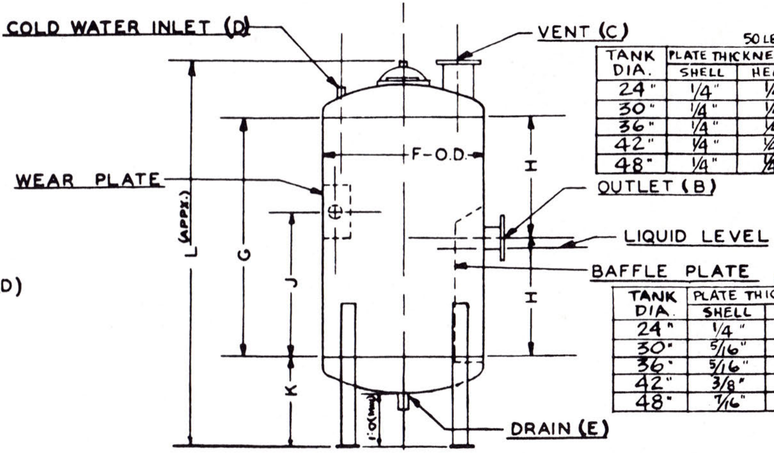
5


MVCCo

6

CODE TANKS


INLET (A)
N
MANHOLE 11"X15"
M
30°
P
O
COLD WATER INLET (D)
LOCATED HERE ON
24" DIA TANKS


COLD WATER INLET (D)
VENT (C)
WEAR PLATE
F-O.D.
L (APPX.)
G
J
K
H
H
OUTLET (B)
LIQUID LEVEL
BAFFLE PLATE
DRAIN (E)
1'-0" (MIN.)

50 LB. W.P.

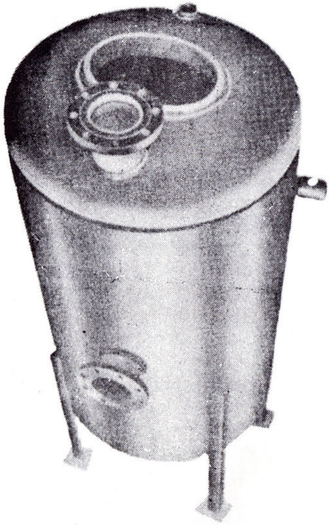
TANK DIA.	PLATE THICKNESS	
	SHELL	HEADS
24"	1/4"	1/4"
30"	1/4"	1/4"
36"	1/4"	1/4"
42"	1/4"	1/4"
48"	1/4"	1/4"

150 LB. W.P.

TANK DIA.	PLATE THICKNESS	
	SHELL	HEADS
24"	1/4"	5/16"
30"	5/16"	3/8"
36"	5/16"	7/16"
42"	3/8"	1/2"
48"	7/16"	9/16"

CAPACITY IN GALLONS CONFORMS TO MINN. REQUIREMENTS 1950 REV.

CAP.	DWG. NO.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P
40	B-41162	2"	4"	4"	1"	2½"	24"	36"	18"	24"	18½	68	12"	10¼"	8"	9"
52	B-41163	2"	4"	4"	1"	2½"	24"	48"	24"	30"	18½	80	12"	10¼"	8"	9"
65	B-41164	2"	4"	4"	1"	2½"	30"	36"	18"	24"	19½	70½	14"	13¼"	11"	11"
83	B-41165	2"	4"	4"	1"	2½"	30"	48"	24"	30"	19½	82½	14"	13¼"	11"	11"
133	B-41166	2½"	5"	5"	1"	2½	36"	54"	27"	33"	20½	89½	15"	16"	12"	14"
146	B-41167	2½"	5"	5"	1½"	2½	36"	60"	30"	36"	20½	95½	15"	16"	12"	14"
218	B-41168	2½"	6"	6"	1½"	2½	42"	66"	33"	39"	22"	104½	15¾	19"	15"	15½
312	B-41169	2½"	6"	6"	1½"	2½	48"	72"	36"	42"	23	113"	16½"	22"	18"	17"



Kenny Blow-Off Tanks

A.S.M.E. CODE TANKS

Kenny A.S.M.E. blow-off tanks are designed and fabricated to comply with the American Society of Mechanical Engineers Unfired Pressure Vessel Code and to State Codes and Regulations.

Each tank shell plates are ⅜″ or more in thickness and are of flange quality steel, electrically welded. The water content is such that the vapor disengagement space is one-half or more of the volume of the tank. The area of the outlet is at least twice the area of the inlet, and the area of the vent is at least four times the area of the inlet.

The inlet enters the shell at a tangent and above the water in the tank. A wearing plate is attached to the inside of the shell opposite the inlet opening and thus increases the tank thickness to the impinging steam being discharged from the boiler.

The outlet is connected with an internal baffle extending to within a few inches of the bottom of the tank. The tank heads are flanged and dished, and one 11″ x 15″ manhole and one cold water inlet furnished. Attached to the shell are supporting legs elevating the tank at least twelve inches above the floor for drain pipe clearance. All tanks are provided with a drain opening and are completely drainable.

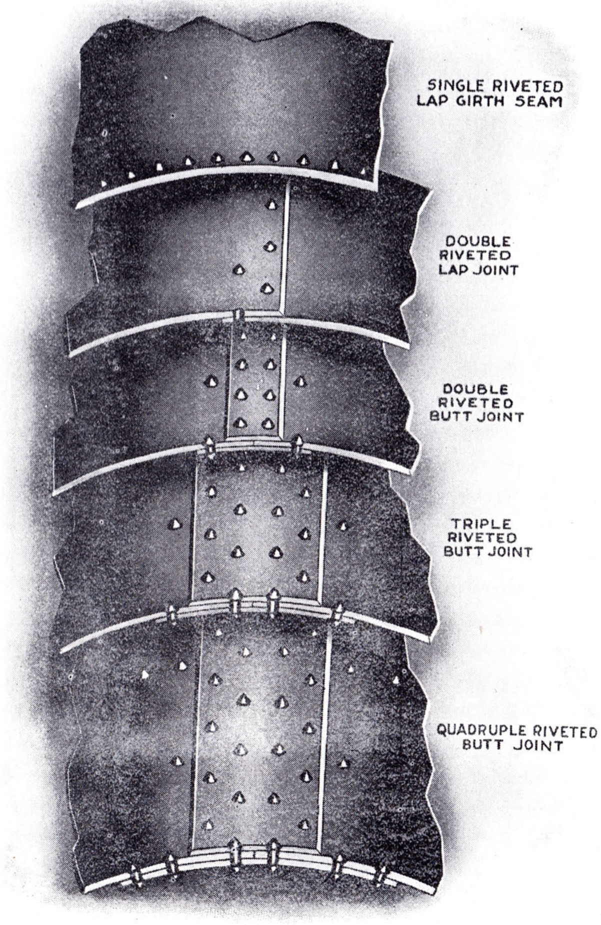
RECOMMENDED FOR BOILERS OPERATING AT
100 LBS. PRESSURE OR LESS

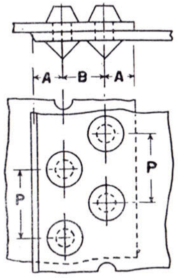
SIZE	DRAWING NO.	PRESSURE	SHIPPING WT.	BOILER H.P. RATING
24″ x 36″	B-41162	50#	770#	3 to 10 H.P.
24″ x 48″	B-41163	50#	880#	11 to 25 H.P.
30″ x 36″	B-41164	50#	960#	26 to 50 H.P.
30″ x 48″	B-41165	50#	1080#	51 to 75 H.P.
36″ x 54″	B-41166	50#	1440#	76 to 150 H.P.
36″ x 60″	B-41167	50#	1500#	151 to 250 H.P.
42″ x 66″	B-41168	50#	1875#	251 to 600 H.P.
42″ x 72″	B-41169	50#	2280#	OVER 600 H.P.

RECOMMENDED FOR BOILERS OPERATING AT
300 LBS. PRESSURE OR LESS

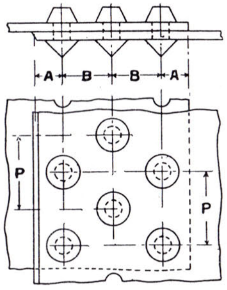
SIZE	DRAWING NO.	PRESSURE	SHIPPING WT.	BOILER H.P. RATING
24″ x 36″	B-39178	150#	800#	3 to 10 H.P.
24″ x 48″	B-39662	150#	860#	11 to 25 H.P.
30″ x 36″	B-38343	150#	1070#	26 to 50 H.P.
30″ x 48″	B-39317	150#	1200#	51 to 75 H.P.
36″ x 54″	B-38344	150#	1670#	76 to 150 H.P.
36″ x 60″	B-39665	150#	1800#	151 to 250 H.P.
42″ x 66″	B-37832	150#	2900#	251 to 600 H.P.
48″ x 72″	B-37833	150#	3530#	OVER 600 H.P.

Longitudinal Riveted Joints

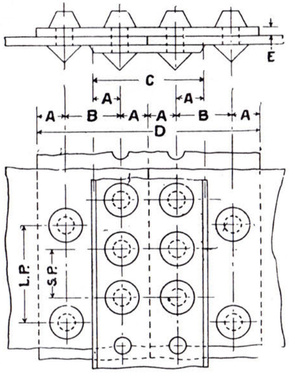

SINGLE RIVETED LAP GIRTH SEAM
DOUBLE RIVETED LAP JOINT
DOUBLE RIVETED BUTT JOINT
TRIPLE RIVETED BUTT JOINT
QUADRUPLE RIVETED BUTT JOINT



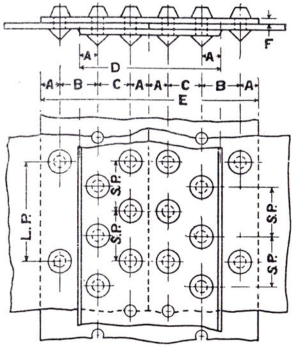
Double Riveted Lap Joint



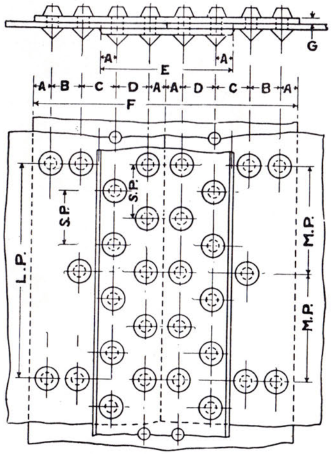
Triple Riveted Lap Joint


E
C
A
A
A
B
A
A
B
A
D
L.P.
S.P.

Double Riveted Butt Joint


F
A
A
D
A
B
C
A
A
C
B
A
E
L.P.
S.P.
S.P.
S.P.
S.P.

Triple Riveted Butt Joint


G
A
A
E
A
B
C
D
A
A
D
C
B
A
F
L.P.
S.P.
S.P.
M.P.
M.P.

Quadruple Riveted Butt Joint

Dimensions of Riveted Joints

Thickness Plate	Dia. Rivet Hole	Girth Seam	Double Lap				Triple Lap				Double Butt								Thickness Plate
		P	A	B	P	%	A	B	P	%	A	B	C	D	E	L.P.	S.P.	%	
1/4	11/16	2 3/16	1 1/16	1 1/2	2 9/16	73.1	1 1/16	1 7/8	3	77.0	1 1/16	2 1/8	4 1/4	8 1/2	1/4	3 5/8	1 13/16	81.0	1/4
9/32	11/16	2 3/16	1 1/16	1 1/2	2 1/2	72.5	1 1/16	1 7/8	3	77.0	1 1/16	2 1/8	4 1/4	8 1/2	1/4	3 5/8	1 13/16	81.0	9/32
5/16	13/16	2 3/16	1 7/32	1 3/4	2 7/8	71.7	1 7/32	2 1/8	3 1/4	75.0	1 7/32	2 7/16	4 7/8	9 3/4	9/32	4 1/16	2 1/32	80.0	5/16
11/32	13/16	2 1/4	1 7/32	1 3/4	2 7/8	71.7	1 7/32	2 1/8	3 1/4	75.0	1 7/32	2 7/16	4 7/8	9 3/4	9/32	4 1/16	2 1/32	80.0	11/32
3/8	13/16	2 1/4	1 1/4	1 3/4	2 3/4	70.3	1 1/4	2 1/8	3 1/4	75.0	1 1/4	2 1/2	5	10	5/16	4 1/4	2 1/8	80.0	3/8
13/32	15/16	2 1/4	1 13/32	1 7/8	3 1/8	70.0	1 13/32	2 3/8	3 3/4	75.0	1 13/32	2 13/16	5 5/8	11 1/4	11/32	4 11/16	2 11/32	80.0	13/32
7/16	15/16	2 3/8	1 13/32	1 7/8	3 1/8	70.0	1 13/32	2 3/8	3 3/4	75.0									7/16
15/32	15/16	2 3/8	1 7/16	1 7/8	3	68.7	1 7/16	2 3/8	3 3/4	75.0									15/32
1/2	15/16	3 3/8	1 7/16	1 7/8	2 7/8	67.2	1 7/16	2 3/8	3 3/4	75.0									1/2

Thickness Plate	Dia. Rivet Hole	Triple Butt									Quadruple Butt											Thickness Plate
		A	B	C	D	E	F	L.P.	S.P.	%	A	B	C	D	E	F	G	L.P.	M.P.	S.P.	%	
5/16	13/16	1 7/32	2 7/16	1 15/16	8 3/4	13 5/8	1/4	6 1/2	3 1/4	87.5												
11/32	13/16	1 7/32	2 7/16	1 15/16	8 3/4	13 5/8	1/4	6 1/2	3 1/4	87.5	1 7/32	2 1/8	2 7/16	2 3/16	9 1/4	18 3/8	1/4	14 1/4	7 1/8	3 9/16	94.3	11/32
3/8	13/16	1 1/4	2 1/2	1 15/16	8 7/8	13 7/8	5/16	6 1/2	3 1/4	87.5	1 1/4	2 1/8	2 1/2	2 3/16	9 3/8	18 5/8	5/16	14 1/4	7 1/8	3 9/16	94.3	3/8
13/32	15/16	1 13/32	2 13/16	2 1/32	9 11/16	15 5/16	5/16	6 3/4	3 3/8	86.1	1 13/32	2 3/8	2 13/16	2 11/32	10 5/16	20 11/16	5/16	14 3/4	7 3/8	3 11/16	93.5	13/32
7/16	15/16	1 13/32	2 13/16	2 1/32	9 11/16	15 5/16	3/8	6 3/4	3 3/8	86.1	1 13/32	2 3/8	2 13/16	2 11/32	10 5/16	20 11/16	3/8	15 1/4	7 5/8	3 13/16	93.8	7/16
15/32	15/16	1 7/16	2 7/8	2 1/8	10	15 3/4	3/8	7	3 1/2	86.6	1 7/16	2 3/8	2 7/8	2 11/32	10 7/16	20 15/16	3/8	15 5/8	7 13/16	3 29/32	94.0	15/32
1/2	15/16	1 7/16	2 7/8	2 1/8	10	15 3/4	3/8	7	3 1/2	86.6	1 7/16	2 3/8	2 7/8	2 11/32	10 7/16	20 15/16	3/8	15 5/8	7 13/16	3 29/32	94.0	1/2
17/32	15/16										1 15/32	2 3/8	2 15/16	2 11/32	10 9/16	21 3/16	13/32	15 5/8	7 13/16	3 29/32	94.0	17/32
9/16	15/16										1 15/32	2 3/8	2 15/16	2 11/32	10 9/16	21 3/16	7/16	15 5/8	7 13/16	3 29/32	92.4	9/16

Based on T. S.—60,000; Riv. Shear—42,000; Riv. Crush—95,000.

Properties of Saturated Steam

(From Peabody's Tables)

Above Atmospheric Pressure

Gauge Press. in Lbs. per Sq. In.	Temperature in Degrees F.	Total Heat in Heat Units from Water at 32°F.	Heat Units in Liquid from 32°F.	Heat of Vaporization in Heat Units	Density of Weight of 1 Cubic Foot in Lbs.	Volume of 1 Lb. in Cubic Feet	Weight of 1 Cubic Foot of Water
0	212.00	1146.6	180.8	965.8	0.03760	26.60	59.76
10	239.36	1154.9	208.4	946.5	0.06128	16.32	59.04
20	258.68	1160.8	227.9	932.9	0.08439	11.85	58.50
30	273.87	1165.5	243.2	922.3	0.1070	9.347	58.07
40	286.54	1169.3	255.9	913.4	0.1292	7.736	57.69
50	297.46	1172.6	266.9	905.7	0.1512	6.612	57.32
55	302.42	1174.2	271.9	902.3	0.1621	6.169	57.22
60	307.10	1175.6	276.6	899.0	0.1729	5.784	57.08
65	311.54	1176.9	281.1	895.8	0.1837	5.443	56.95
70	315.77	1178.2	285.6	892.7	0.1945	5.142	56.82
75	319.80	1179.5	289.8	889.8	0.2052	4.873	56.69
80	323.66	1180.6	293.8	886.9	0.2159	4.633	56.59
85	327.36	1181.8	297.7	884.2	0.2265	4.415	56.47
90	330.92	1182.8	301.5	881.5	0.2371	4.218	56.36
95	334.35	1183.9	305.0	879.0	0.2477	4.037	56.25
100	337.66	1184.9	308.5	876.5	0.2583	3.872	56.18
105	340.86	1185.9	311.8	874.1	0.2689	3.720	56.07
110	343.95	1186.8	315.0	871.8	0.2794	3.580	55.97
115	346.94	1187.7	318.2	869.6	0.2898	3.452	55.87
120	349.85	1188.6	321.2	867.4	0.3003	3.330	55.77
125	352.68	1189.5	324.2	865.3	0.3107	3.219	55.69
130	355.43	1190.3	327.0	863.3	0.3212	3.113	55.58
135	358.10	1191.1	329.8	861.3	0.3315	3.017	55.52
140	360.70	1191.9	332.5	859.4	0.3420	2.924	55.44
145	363.25	1192.8	335.2	857.5	0.3524	2.838	55.36
150	365.73	1193.5	337.8	855.7	0.3629	2.756	55.29
155	368.62	1194.3	340.3	853.9	0.3731	2.681	55.22
160	370.51	1195.0	342.8	852.1	0.3835	2.608	55.15
165	372.83	1195.7	345.2	850.4	0.3939	2.539	55.07
170	375.09	1196.3	347.6	848.7	0.4043	2.474	54.99
175	377.31	1197.0	349.9	847.1	0.4147	2.412	54.93
180	379.48	1197.7	352.2	845.4	0.4251	2.353	54.86
185	381.60	1198.3	354.4	843.9	0.4353	2.297	54.79
190	383.70	1199.0	356.6	842.3	0.4455	2.244	54.73
195	385.75	1199.6	358.8	840.8	0.4559	2.193	54.66
200	387.76	1200.2	360.9	839.2	0.4663	2.145	54.60
205	397.36	1203.1	370.9	832.2	0.5179	1.930	54.27
250	406.07	1205.8	380.1	825.7	0.5699	1.755	54.03
275	414.22	1208.3	388.5	819.8	0.6210	1.609	53.77
300	421.83	1210.6	396.5	814.1	0.6740	1.483	53.54

Below Atmospheric Pressure

Vacuum Gauge In. of Mercury	Absolute Pressure Lbs. per Sq. In.	Temperature Fahrenheit	Tot. Ht. above 32°F.		Latent Heat L–H-h Heat Units	Relative Vol. of Water at 39°F.	Vol. Cu. Ft. in 1 Lb. of Steam	Weight of 1 Cu. Ft. Steam Lb.
			In the Water h Ht. Units	In the Steam h Ht. Units				
29.74	.089	32.	0.	1091.7	1091.7	208080	3333.3	.00030
29.67	.122	40.	8.	1094.1	1086.1	154330	2472.2	.00040
29.56	.176	50.	18.	1097.2	1079.2	107630	1724.1	.00058
29.40	.254	60.	28.01	1100.2	1072.2	76370	1223.4	.00082
29.19	.359	70.	38.02	1103.3	1065.3	54660	875.61	.00115
28.90	.502	80.	48.04	1106.3	1058.3	39690	635.80	.00158
28.51	.692	90.	58.06	1109.4	1051.3	29290	469.20	.00213
28.00	.943	100.	68.08	1112.4	1044.4	21830	349.70	.00286
27.88	1.	102.1	70.09	1113.1	1043.0	20623	334.23	.00299
25.85	2.	126.3	94.44	1120.5	1026.0	10730	173.23	.00577
23.83	3.	141.6	109.9	1125.1	1015.3	7325	117.98	.00848
21.78	4.	153.1	121.4	1128.6	1007.2	5588	89.80	.01112
19.74	5.	162.3	130.7	1131.4	1000.7	4530	72.50	.01373
17.70	6.	170.1	138.6	1133.8	995.2	3816	61.10	.01631
15.67	7.	176.9	145.4	1135.9	990.5	3302	53.00	.01887
13.63	8.	182.9	151.5	1137.7	986.2	2912	46.60	.02140
11.60	9.	188.3	156.9	1139.4	982.4	2607	41.82	.02391
9.56	10.	193.2	161.9	1140.9	979.0	2361	37.80	.02641
7.52	11.	197.8	166.5	1142.3	975.8	2159	34.61	.02889
5.49	12.	202.0	170.7	1143.5	972.8	1990	31.90	.03136
3.45	13.	205.9	174.7	1144.7	970.0	1846	29.58	.03381
1.41	14.	209.6	178.4	1145.9	967.4	1721	27.59	.03625

Percentage Saved by Heating Feed-Water

The marked economy of heating feed-water before entering the boiler, to a temperature as high as possible, by the utilization of heat otherwise wasted, has been recognized and is now well understood. The waste heat usually employed for this purpose is contained in the exhaust steam from non-condensing engines. To effect this saving, what is termed a "heater" is used.

The following table taken from Kent furnishes a ready and accurate means of determining the percentage of the gain obtained by heating feed-water.

Feed-Water Heaters

Percentage of saving for each degree of increase in temperature of feed-water heated by waste steam.

Initial Temperature of Feed, Degrees	Pressure of Steam in Boiler, Pounds per Square Inch Above Atmosphere											Initial Temperature Degrees
	0	20	40	60	80	100	120	140	160	180	200	
32	.0872	.0861	.0855	.0851	.0847	.0844	.0841	.0839	.0837	.0835	.0833	32
40	.0878	.0867	.0861	.0856	.0853	.0850	.0847	.0845	.0843	.0841	.0839	40
50	.0886	.0875	.0868	.0864	.0860	.0857	.0854	.0852	.0850	.0848	.0846	50
60	.0894	.0883	.0876	.0872	.0867	.0864	.0862	.0859	.0856	.0855	.0853	60
70	.0902	.0890	.0884	.0879	.0875	.0872	.0869	.0867	.0864	.0862	.0860	70
80	.0910	.0898	.0891	.0887	.0883	.0879	.0877	.0874	.0872	.0870	.0868	80
90	.0919	.0907	.0900	.0895	.0888	.0887	.0884	.0883	.0879	.0877	.0875	90
100	.0927	.0915	.0908	.0903	.0899	.0895	.0892	.0890	.0887	.0885	.0883	100
110	.0936	.0923	.0916	.0911	.0907	.0903	.0900	.0898	.0895	.0893	.0891	110
120	.0945	.0932	.0925	.0919	.0915	.0911	.0908	.0906	.0903	.0901	.0899	120
130	.0954	.0941	.0934	.0928	.0924	.0920	.0917	.0914	.0912	.0909	.0907	130
140	.0963	.0950	.0943	.0937	.0932	.0929	.0925	.0923	.0920	.0918	.0916	140
150	.0973	.0959	.0951	.0946	.0941	.0937	.0934	.0931	.0929	.0926	.0924	150
160	.0982	.0968	.0961	.0955	.0950	.0946	.0943	.0940	.0937	.0935	.0933	160
170	.0992	.0978	.0970	.0964	.0959	.0955	.0952	.0949	.0946	.0944	.0941	170
180	.1002	.0988	.0981	.0973	.0969	.0965	.0961	.0958	.0955	.0953	.0951	180
190	.1012	.0998	.0989	.0983	.0978	.0974	.0971	.0968	.0964	.0962	.0960	190
200	.1022	.1008	.0999	.0993	.0988	.0984	.0980	.0977	.0974	.0972	.0969	200
210	.1033	.1018	.1009	.1003	.0998	.0994	.0990	.0987	.0984	.0981	.0979	210
220		.1029	.1019	.1013	.1008	.1004	.1000	.0997	.0994	.0991	.0989	220
230		.1039	.1031	.1024	.1018	.1012	.1010	.1007	.1003	.1001	.0999	230
240		.1050	.1041	.1034	.1029	.1024	.1020	.1017	.1014	.1011	.1009	240
250		.1062	.1052	.1045	.1040	.1035	.1031	.1027	.1025	.1022	.1019	250

Example with table: Given boiler pressure at 100 lbs., feed-water temperature 60° F. heated to 209° F. Required per cent of saving obtained.

In the column headed 100 pounds, follow down until opposite 60 in column of degrees, where you will find .0864, which number multiplied by 149 (difference in degrees between 209 and 60) gives 12.96, which is the per cent gained by heating the feed-water from 60° to 209°.

Calculation of Saving:—The total heat in steam above 32 degrees F. at 100 lbs. gauge is 1185 B. T. U.; that in water at 60 degrees F. is 28. 1185—28=1157 B. T. U. in steam above that in cold feed-water. The raise in temperature is 209°—60°=149°. The per cent gained is 149/1157=12.96 per cent as obtained by above table.

U. S. Gallons in Round Tanks

For One Foot in Depth

Dia. of Tanks	No. U. S. Gals.	Cu. Ft. and Area in Sq. Ft.	Dia. of Tanks	No. U. S. Gals.	Cu. Ft. and Area in Sq. Ft.	Dia. of Tanks	No. U. S. Gals.	Cu. Ft. and Area in Sq. Ft.	Dia. of Tanks	No. U. S. Gals.	Cu. Ft. and Area in Sq. Ft.	Dia. of Tanks	No. U. S. Gals.	Cu. Ft. and Area in Sq. Ft.	Dia. of Tanks	No. U. S. Gals.	Cu. Ft. and Area in Sq. Ft.
1′	5.87	.785	3′ 4″	65.28	8.727	5′ 8″	188.66	25.22	**12′**	846.03	113.10	**19′**	2120.9	283.53	**26′**	3971.6	530.93
1′ 1″	6.89	.922	3′ 5″	68.58	9.168	5′ 9″	194.25	25.97	12′ 3″	881.65	117.86	19′ 3″	2177.1	291.04	26′ 3″	4048.4	541.19
1′ 2″	8.00	1.069	3′ 6″	71.97	9.621	5′ 10″	199.92	26.73	12′ 6″	918.00	122.72	19′ 6″	2234.0	298.65	26′ 6″	4125.9	551.55
1′ 3″	9.18	1.227	3′ 7″	75.44	10.085	5′ 11″	205.67	27.49	12′ 9″	955.09	127.68	19′ 9″	2291.7	306.35	26′ 9″	4204.1	562.00
1′ 4″	10.44	1.396	3′ 8″	78.99	10.559	**6′**	211.51	28.27	**13′**	992.91	132.73	**20′**	2350.1	314.16	**27′**	4283.0	572.66
1′ 5″	11.79	1.576	3′ 9″	82.62	11.045	6′ 3″	229.50	30.68	13′ 3″	1031.50	137.89	20′ 3″	2409.2	322.06	27′ 3″	4362.7	583.21
1′ 6″	13.22	1.767	3′ 10″	86.33	11.541	6′ 6″	248.23	33.18	13′ 6″	1070.80	143.14	20′ 6″	2469.1	330.06	27′ 6″	4443.1	593.96
1′ 7″	14.73	1.969	3′ 11″	90.13	12.048	6′ 9″	267.69	35.78	13′ 9″	1110.80	148.49	20′ 9″	2529.6	338.16	27′ 9″	4524.3	604.81
1′ 8″	16.32	2.182	**4′**	94.00	12.566	**7′**	287.88	38.48	**14′**	1151.50	153.94	**21′**	2591.0	346.36	**28′**	4606.2	615.75
1′ 9″	17.99	2.405	4′ 1″	97.96	13.095	7′ 3″	308.81	41.28	14′ 3″	1193.00	159.48	21′ 3″	2653.0	354.66	28′ 3″	4688.8	626.80
1′ 10″	19.75	2.640	4′ 2″	102.00	13.635	7′ 6″	330.48	44.18	14′ 6″	1235.30	165.13	21′ 6″	2715.8	363.05	28′ 6″	4772.1	637.94
1′ 11″	21.58	2.885	4′ 3″	106.12	14.186	7′ 9″	352.88	47.17	14′ 9″	1278.20	170.87	21′ 9″	2779.3	371.54	28′ 9″	4856.2	649.18
2′	23.50	3.142	4′ 4″	110.32	14.748	**8′**	376.01	50.27	**15′**	1321.90	176.71	**22′**	2843.6	380.13	**29′**	4941.0	660.52
2′ 1″	25.50	3.409	4′ 5″	114.61	15.321	8′ 3″	399.88	53.46	15′ 3″	1366.40	182.65	22′ 3″	2908.6	388.82	29′ 3″	5026.6	671.96
2′ 2″	27.58	3.687	4′ 6″	118.97	15.90	8′ 6″	424.48	56.75	15′ 6″	1411.50	188.69	22′ 6″	2974.3	397.61	29′ 6″	5112.9	683.49
2′ 3″	29.74	3.976	4′ 7″	123.42	16.50	8′ 9″	449.82	60.13	15′ 9″	1457.40	194.83	22′ 9″	3040.8	406.49	29′ 9″	5199.9	695.13
2′ 4″	31.99	4.276	4′ 8″	127.95	17.10	**9′**	475.89	63.62	**16′**	1504.10	201.06	**23′**	3108.0	415.48	**30′**	5287.7	706.86
2′ 5″	34.31	4.587	4′ 9″	132.56	17.72	9′ 3″	502.70	67.20	16′ 3″	1551.40	207.39	23′ 3″	3175.9	424.56	30′ 3″	5376.2	718.69
2′ 6″	36.72	4.909	4′ 10″	137.25	18.35	9′ 6″	530.24	70.88	16′ 6″	1599.50	213.82	23′ 6″	3244.6	433.74	30′ 6″	5465.4	730.62
2′ 7″	39.21	5.241	4′ 11″	142.02	18.99	9′ 9″	558.51	74.66	16′ 9″	1648.40	220.35	23′ 9″	3314.0	443.01	30′ 9″	5555.4	742.64
2′ 8″	41.78	5.585	**5′**	146.88	19.63	**10′**	587.52	78.54	**17′**	1697.90	226.98	**24′**	3384.1	452.39	**31′**	5646.1	754.77
2′ 9″	44.43	5.940	5′ 1″	151.82	20.29	10′ 3″	617.26	82.52	17′ 3″	1748.20	233.71	24′ 3″	3455.0	461.86	31′ 3″	5737.5	766.99
2′ 10″	47.16	6.305	5′ 2″	156.83	20.97	10′ 6″	640.74	86.59	17′ 6″	1799.30	240.53	24′ 6″	3526.6	471.44	31′ 6″	5829.7	779.31
2′ 11″	49.98	6.681	5′ 3″	161.93	21.65	10′ 9″	678.95	90.76	17′ 9″	1851.10	247.45	24′ 9″	3598.9	481.11	31′ 9″	5922.6	791.73
3′	52.88	7.069	5′ 4″	167.12	22.34	**11′**	710.90	95.03	**18′**	1903.60	254.47	**25′**	3672.0	490.87	**32′**	6016.2	804.25
3′ 1″	55.86	7.467	5′ 5″	172.38	23.04	11′ 3″	743.58	99.40	18′ 3″	1956.80	261.59	25′ 3″	3745.8	500.74	32′ 3″	6110.6	816.86
3′ 2″	58.92	7.876	5′ 6″	177.72	23.76	11′ 6″	776.99	103.87	18′ 6″	2010.80	268.80	25′ 6″	3820.3	510.71	32′ 6″	6205.7	829.58
3′ 3″	62.06	8.296	5′ 7″	183.15	24.48	11′ 9″	811.14	108.43	18′ 9″	2065.50	276.12	25′ 9″	3895.6	520.77	32′ 9″	6301.5	842.39

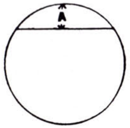
To find the capacity of tanks greater than the largest given in the table, look in the table for a tank of one-half of the given size, and multiply its capacity by 4; or, one of one-third its size, and multiply its capacity by 9, etc.

Number of U. S. Gallons in Rectangular Tanks

For One Foot in Depth

Width of Tank	LENGTH OF TANK																				
	2′0″	**2′6″**	**3′0″**	**3′6″**	**4′0″**	**4′6″**	**5′0″**	**5′6″**	**6′0″**	**6′6″**	**7′0″**	**7′6″**	**8′0″**	**8′6″**	**9′0″**	**9′6″**	**10′0″**	**10′6″**	**11′0″**	**11′6″**	**12′0″**
2 ft.	29.92	37.40	44.88	52 36	59.84	67.32	74.81	82.29	89.77	97.25	104.73	112.21	119.69	127.17	134.65	142.13	149.61	157.09	164.57	172.05	179.53
2 ft. **6** in.		46.75	56.10	65.45	74.80	84.16	93.51	102.86	112.21	121.56	130.91	140.26	149.61	158.96	168.31	177.66	187.01	196.36	205.71	215.06	224.41
3 ft.			67.32	78.54	89.77	100.99	112.21	123.43	134.65	145.87	157.09	168.31	179.53	190.75	202.97	213.19	224.41	235.63	246.86	258.07	269.30
3 ft. **6** in.				91.64	104.73	117.82	130.91	144.00	157.09	170.18	183.27	196.36	209.45	222.54	235.63	248.73	261.82	274.90	288.00	301.09	314.18
4 ft.					119.69	134.65	149.61	164.57	179.53	194.49	209.45	224.41	239.37	254.34	269.30	284.26	299.22	314.18	329.14	344.10	359.06
4 ft. **6** in.						151.48	168.31	185.14	201.97	218.80	235.63	252.47	269.30	286.13	302.96	319.79	336.62	353.45	370.28	387.11	403.94
5 ft.							187.01	205.71	224.41	243.11	261.82	280.52	299.22	317.92	336.62	355.32	374.03	392.72	411.43	430.13	448.83
5 ft. **6** in.								226.28	246.86	267.43	288.00	308.57	329.14	349.71	370.28	390.85	411.43	432.00	452.57	473.14	493.71
6 ft.									269.30	291.74	314.18	336.62	359.06	381.50	403.94	426.39	448.83	471.27	493.71	516.15	538.59
6 ft. **6** in.										316.05	340.36	364.67	388.98	413.30	437.60	461.92	486.23	510.54	534.85	559.16	583.47
7 ft.											366.54	392.72	418.91	445.09	471.27	497.45	523.64	549.81	575.99	602.18	628.36
7 ft. **6** in.												420.78	448.83	476.88	504.93	532.98	561.04	589.08	617.14	645.19	673.24
8 ft.													478.75	508.67	538.59	568.51	598.44	628.36	658.28	688.20	718.12
8 ft. **6** in.														540.46	572.25	604.05	635.84	667.63	699.42	731.21	763.00
9 ft.															605.92	639.58	673.25	706.90	740.56	774.23	807.89
9 ft. **6** in.																675.11	710.65	746.17	781.71	817.24	852.77
10 ft.																	748.05	785.45	822.86	860.26	897.66
10 ft. **6** in.																		824.73	864.00	903.26	942.56
11 ft.																			905.14	946.27	987.43
11 ft. **6** in.																				989.29	1032.30
12 ft.																					1077.20

Area of Circular Segments



Dimension A in Inches	Area of Segment in Square Inches for Boilers from 30 Inches to 96 Inches in Diameter															
	30″ Boiler	32″ Boiler	34″ Boiler	36″ Boiler	40″ Boiler	42″ Boiler	44″ Boiler	46″ Boiler	48″ Boiler	54″ Boiler	60″ Boiler	66″ Boiler	72″ Boiler	78″ Boiler	84″ Boiler	90″ Boiler	96″ Boiler
6	88	93	97	101	108	111	114	118	120	131	139	147	153	161	166	178	179
7	109	115	120	125	134	139	143	148	151	162	173	183	194	203	207	219	225
8	131	138	145	151	163	168	173	179	183	197	211	217	235	247	256	267	266
9	155	163	170	178	192	199	208	212	216	234	249	276	289	294	305	318	331
10	178	188	197	206	223	230	238	266	253	272	268	308	325	339	357	372	386
11	202	214	224	234	254	263	272	281	288	312	333	354	372	390	411	428	448
12	226	239	252	264	286	297	306	319	325	354	378	403	422	443	462	486	502
13	230	266	280	293	319	331	343	354	364	394	423	449	473	498	520	541	564
14			307	323	353	367	379	392	404	438	471	500	529	555	580	609	627
15				354	386	399	415	431	444	482	517	553	583	613	637	667	693
16					421	437	454	469	483	527	567	603	639	628	708	733	760
17					454	473	491	509	523	573	616	658	695	734	764	794	829
18							528	548	566	620	665	714	753	796	830	859	905
19							567	588	608	665	717	767	812	855	897	929	977
20									650	712	770	824	875	919	966	1011	1051
21										760	821	882	932	985	1035	1083	1126
22										808	876	937	997	1051	1101	1151	1202
23											927	996	1059	1118	1172	1232	1279
24											982	1056	1121	1186	1245	1308	1357
25											1037	1113	1184	1255	1318	1385	1436
26											1090	1173	1248	1325	1392	1456	1515
27												1234	1316	1395	1467	1535	1605
28													1381	1460	1537	1614	1687
29													1446	1531	1607	1695	1770
30													1510	1602	1690	1775	1853
31														1674	1767	1843	1938
32														1746	1844	1939	2023
33															1922	2014	2108
34															1995	2104	2194
35																2188	2283
36																2264	2376
37																	2463
38																	2551

Circumferences and Areas of Circles

OF ONE-INCH								OF INCHES OR FEET											
Fract.	Dec.	Circ.	Area	Fract.	Dec.	Circ.	Area	Dia.	Circ.	Area	Dia.	Circ.	Area	Dia.	Circ.	Area	Dia.	Circ.	Area
1/64	.015625	.04909	.00019	**33/64**	.515625	1.6199	.20880	1	3.1416	.7854	33	103.67	855.30	65	204.20	3318.31	97	304.73	7339.81
1/32	.03125	.09818	.00077	**17/32**	.53125	1.6690	.22166	2	6.2832	3.1416	34	106.81	907.92	66	207.34	3421.19	98	307.88	7542.96
3/64	.046875	.14726	.00173	**35/64**	.546875	1.7181	.23489	3	9.4248	7.0686	35	109.96	962.11	67	210.49	3525.65	99	311.02	7697.69
1/16	.0625	.19635	.00307	**9/16**	.5625	1.7671	.24850	4	12.5664	12.5664	36	113.10	1017.88	68	213.63	3631.68	100	314.16	7853.98
5/64	.078125	.24545	.00479	**37/64**	.578125	1.8163	.26248	5	15.7080	19.635	37	116.24	1075.21	69	216.77	3739.28	101	317.30	8011.85
3/32	.09375	.29452	.00690	**19/32**	.59375	1.8653	.27688	6	18.850	28.274	38	119.38	1134.11	70	219.91	3848.45	102	320.44	8171.28
7/64	.109375	.34363	.00939	**39/64**	.609375	1.9145	.29164	7	21.991	38.485	39	122.52	1194.59	71	223.05	3959.19	103	323.58	8332.29
1/8	.125	.39270	.01227	**5/8**	.625	1.9635	.30680	8	25.133	50.266	40	125.66	1256.64	72	226.19	4071.50	104	326.73	8494.87
9/64	.140625	.44181	.01553	**41/64**	.640625	2.0127	.32232	9	28.274	63.617	41	128.81	1320.25	73	229.34	4185.39	105	329.87	8659.01
5/32	.15625	.49087	.01917	**21/32**	.65625	2.0617	.33824	10	31.416	78.540	42	131.95	1385.44	74	232.48	4300.84	106	333.01	8824.73
11/64	.171875	.53999	.02320	**43/64**	.671875	2.1108	.35453	11	34.558	95.033	43	135.09	1452.20	75	235.62	4417.86	107	336.15	8992.02
3/16	.1875	.58905	.02761	**11/16**	.6875	2.1598	.37122	12	37.699	113.1	44	138.23	1520.53	76	238.76	4536.46	108	339.29	91.6088
13/64	.203125	.63817	.03241	**45/64**	.703125	2.2090	.38828	13	40.841	132.73	45	141.37	1590.43	77	241.90	4656.63	109	342.43	9331.32
7/32	.21875	.68722	.03758	**23/32**	.71875	2.2580	.40574	14	43.982	153.94	46	144.51	1661.90	78	245.04	4778.36	110	345.58	9503.32
15/64	.234375	.73635	.04314	**47/64**	.734375	2.3072	.42356	15	47.124	176.71	47	147.65	1734.94	79	248.19	4901.67	111	348.72	9676.89
1/4	.25	.78540	.04909	**3/4**	.75	2.3562	.44179	16	50.265	201.06	48	150.80	1809.56	80	251.33	5026.55	112	251.86	9852.03
17/64	.265625	.83453	.05542	**49/64**	.765625	2.4054	.45253	17	53.407	226.98	49	153.94	1885.74	81	254.47	5153.00	113	355.00	10028.75
9/32	.28125	.88357	.06213	**25/32**	.78125	2.4544	.47937	18	56.549	254.47	50	157.08	1963.50	82	257.61	5281.02	114	358.14	10207.03
19/64	.296875	.93271	.06922	**51/64**	.796875	2.5036	.49872	19	59.690	283.53	51	160.22	2042.82	83	260.75	5410.61	115	361.28	10386.89
5/16	.3125	.98175	.07670	**13/16**	.8125	2.5525	.51849	20	62.832	314.16	52	163.36	2123.72	84	263.89	5541.77	116	364.42	10568.32
21/64	.328125	1.0309	.08456	**53/64**	.828125	2.6017	.53862	21	65.973	346.36	53	166.50	2206.18	85	267.04	5674.50	117	367.57	10751.32
11/32	.34375	1.0799	.09281	**27/32**	.84375	2.6507	.55914	22	69.115	380.13	54	169.65	2290.22	86	270.18	5808.80	118	370.71	10935.88
23/64	.359375	1.1291	.10144	**55/64**	.859375	2.6999	.58003	23	72.257	415.48	55	172.79	2375.83	87	273.32	5944.68	119	373.85	11122.02
3/8	.375	1.1781	.11045	**7/8**	.875	2.7489	.60132	24	75.398	452.39	56	175.93	2463.01	88	276.46	6082.12	120	376.99	11309.73
25/64	.390625	1.2273	.11984	**57/64**	.890625	2.7981	.62298	25	78.540	490.87	57	179.07	2551.76	89	279.60	6221.14	121	380.13	11499.01
13/32	.40625	1.2763	.12962	**29/32**	.90625	2.8471	.64504	26	81.681	530.93	58	182.21	2642.08	90	282.74	6361.73	122	383.27	11689.87
27/64	.421875	1.3254	.13979	**59/64**	.921875	2.8963	.66746	27	84.823	572.56	59	185.35	2733.97	91	285.88	6503.88	123	386.42	11882.29
7/16	.4375	1.3744	.15033	**15/16**	.9375	2.9452	.69029	28	87.965	615.75	60	188.50	2827.43	92	289.03	6647.61	124	389.56	12076.28
29/64	.453125	1.4236	.16126	**61/64**	.953125	2.9945	.71349	29	91.106	660.52	61	191.64	2922.47	93	292.17	6792.91	125	392.70	12271.85
15/32	.46875	1.4726	.17257	**31/32**	.96875	3.0434	.73708	30	94.248	706.86	62	194.78	3019.07	94	295.31	6939.78	126	395.84	12468.98
31/64	.484375	1.5218	.18427	**63/64**	.984375	3.0928	.76097	31	97.389	754.77	63	197.92	3117.25	95	298.45	7088.22	127	398.98	12667.69
1/2	.5	1.5708	.19635	1	1.00000	3.1416	.7854	32	100.53	804.25	64	201.06	3216.99	96	301.59	7238.23	128	402.12	12867.96

Size of Chimneys for Steam Boilers

Diameter of Stack in Inches	Actual Area in Square Feet	Effective Area in Sq. Ft.	Equivalent Square Chimney	HEIGHT OF STACK IN FEET													
				50	60	70	80	90	100	110	125	150	175	200	225	250	300
				DRAFT POWER IN INCHES OF WATER DUE TO HEIGHT OF STACK													
				.28	.34	.40	.46	.52	.58	.64	.73	.88	1.03	1.18	1.33	1.48	1.78
				HORSE POWER OF BOILERS STACK WILL SERVE													
18	1.77	.97	16	23	25	27	29	31									
20	2.18	1.30	17	31	34	36	39	41									
22	2.64	1.67	19	39	43	46	50	53	57								
24	3.14	2.08	21	49	53	58	62	66	70								
26	3.69	2.54	23	60	65	70	75	80	85								
28	4.28	3.04	25	72	78	84	90	96	102								
30	4.91	3.58	27	84	92	99	106	113	120	127							
32	5.59	4.17	29		108	115	123	130	138	146							
34	6.31	4.80	31		124	133	142	151	160	168	179						
36	7.07	5.47	33		141	152	163	173	182	191	204						
38	7.88	6.20	35			172	184	195	207	218	230						
42	9.62	7.76	38			216	231	245	258	271	289	316					
48	12.57	10.44	43				311	330	348	365	389	426					
54	15.90	13.51	48					427	449	472	503	551	595				
60	19.64	16.98	54					536	565	593	632	692	748				
66	23.76	20.83	59						694	728	776	849	918	981			
72	28.27	25.08	64						835	876	934	1023	1105	1181	1253		
78	33.18	29.73	70							1038	1107	1212	1310	1400	1485	1565	
84	38.48	34.76	75							1214	1294	14 8	1531	1637	1736	1830	2005
90	44.18	40.19	80								1496	1639	1770	1893	2008	2116	2318
96	50.27	46.01	86								1712	1876	2027	2167	2298	2423	2654
102	56.75	52.23	91								1944	2130	2300	2459	2609	2750	3012
108	63.62	58.83	96								2090	2399	2592	2771	2939	3098	3393
114	70.88	65.83	101									2685	2900	3100	3288	3466	3797
120	78.54	73.22	107									2986	3226	3448	3657	3855	4223
132	95.03	89.18	117									3637	3929	4200	4455	4696	5144
144	113.10	106.72	128									4352	4701	5026	5331	5618	6155

DRAFT POWER LOSS IN HORIZONTAL BREECHINGS

Length of flue in feet	50	100	200	400	600	800	1000	2000	3000
Per cent loss in draft	1.0	5	14	27	37	44	50	59	68

Note—1 H. P. based on consumption of 5 pounds of coal per H. P. Draft power based on stack temperature of 500 degrees F., air temperature of 60 degrees F., barometer 14.7″ and dampers open. With dampers partly closed draft power will be increased 20 to 25 per cent.

$H.\ P. = 3.33\ (A - 0.6\sqrt{A})\ \sqrt{H}$. A=Area in square feet. H=Height in feet.

Weights of Iron and Steel Gauges

U. S. STANDARD GAUGE					BIRMINGHAM W. GAUGE			
No. of Gauge	Approximate Thickness in Inches			Weight per Square Foot Iron or Steel	No. of Gauge	Thickness in Inches	Weight Square Foot	
	Steel	Iron	Approx. Fraction				Iron	Steel
7-0's	....	.5	1–2	20.00	......	......	......	....
9-0's	....	.46875	15–32	18.75	......	......	......	....
5-0's	....	.4375	7–16	17.50	......	......	......	....
0000	....	.40625	13–32	16.25	0000	.454	18.22	18.5232
000	....	.375	3–8	15.	000	.425	17.05	17.34
00	....	.34375	11–32	13.75	00	.38	15.25	15.504
0	....	.3125	5–16	12.50	0	.34	13.64	13.872
1	.2757	.28125	9–32	11.25	1	.3	12.04	12.24
2	.2604	.265625	17–64	10.625	2	.284	11.40	11.5872
3	.2451	.25	1–4	10.	3	.259	10.39	10.5672
4	.2298	.234375	15–64	9.375	4	.238	9.55	9.7104
5	.2145	.21875	7–32	8.75	5	.22	8.83	8.976
6	.1991	.203125	13–64	8.125	6	.203	8.15	8.2824
7	.1838	.1875	3–16	7.5	7	.18	7.22	7.344
8	.1685	.171875	11–64	6.875	8	.165	6.62	6.732
9	.1532	.15625	5–32	6.25	9	.148	5.94	6.0384
10	.1379	.140625	9–64	5.625	10	.134	5.38	5.4672
11	.1225	.125	1–8	5.	11	.12	4.82	4.896
12	.1072	.109375	7–64	4.375	12	.109	4.37	4.4972
13	.0919	.09375	3–32	3.75	13	.095	3.81	3.876
14	.0766	.078125	5–64	3.125	14	.083	3.33	3.3864
15	.0689	.0703125	9–128	2.8125	15	.072	2.89	2.9376
16	.0613	.0625	1–16	2.5	16	.065	2.61	2.651

U. S. STANDARD GAUGE					BIRMINGHAM W. GAUGE			
No. of Gauge	Approximate Thickness in Inches			Weight per Square Foot Iron or Steel	No. of Gauge	Thickness in Inches	Weight Square Foot	
	Steel	Iron	Approx. Fraction				Iron	Steel
17	.0551	.05625	9–160	2.25	17	.058	2.33	2.3664
18	.0490	.05	1–20	2.	18	.049	1.97	1.9992
19	.0429	.04375	7–160	1.75	19	.042	1.69	1.7126
20	.0368	.0375	3–80	1.50	20	.035	1.40	1.428
21	.0337	.034375	11–320	1.375	21	.032	1.28	1.3056
22	.0306	.03125	1–32	1.25	22	.028	1.12	1.1424
23	.0276	.028125	9–320	1.125	23	.025	1.00	1.02
24	.0245	.025	1–40	1.	24	.022	.833	.8976
25	.0214	.021875	7–320	.875	25	.02	.803	.816
26	.0184	.01875	3–160	.75	26	.018	.722	.7344
27	.0169	.0171875	11–640	.6875	27	.016	.642	.6528
28	.0153	.015625	1–64	.625	28	.014	.562	.5712
29	.0138	.0140625	9–640	.5625	29	.013	......	.5304
30	.0123	.0125	1–80	.5	30	.012	......	.5896
31	.0107	.0109375	7–640	.4375	31	.01	......	.408
32	.0100	.01015625	13–1280	.40625	32	.009	......	.3672
33	.0092	.009375	3–320	.375	33	.008	......	.3264
34	.0084	.00859375	11–1280	.34375	34	.007	......	.2856
35	.0077	.0078125	5–640	.3125	35	.005	......	.2040
36	.0069	.00703125	9–1280	.28125	36	.004	......	.1632
37	.0065	.006640625	17–2560	.265625	......	......	......	....
38	.0061	.00625	1–160	.25	......	......	......	....

Steel mills roll iron and steel sheets to U. S. Standard Gauge. Plate mills usually roll to Birmingham W. Gauge, unless otherwise ordered. Bands and hoops, cold rolled strip steel and spring steel are rolled to Birmingham W. Gauge. Round wire is rolled to Washburn and Moen Gauge.

Structural I Beams

Manufacturers' Standard Specifications

Size in Inches	Weight per Ft. Lbs.	Thickness of Web	Width of Flange	Stock Lengths Ft.	Size in Inches	Weight per Ft. Lbs.	Thickness of Web	Width of Flange	Stock Lengths Ft.
3	5.7	0.170	2.330	3–50		35	0.602	4.952	3–60
	6.5	0.263	2.423	3–50		40	0.749	5.099	3–60
	7.5	0.361	2.521	3–50	**12**	25	0.270	5.000	3–60
4	7.7	0.190	2.660	3–50		31.8	0.350	5.000	3–60
	8.5	0.263	2.733	3–50		35	0.436	5.086	3–60
	9.5	0.337	2.807	3–50		40.8	0.460	5.250	3–60
	10.5	0.410	2.880	3–50		45	0.576	5.366	3–60
5	10	0.210	3.000	3–60		50	0.699	5.489	3–60
	12.25	0.357	3.147	3–60		55	0.822	5.612	3–60
	14.75	0.504	3.294	3–60	**15**	35	0.330	5.500	3–65
6	12.5	0.230	3.330	3–60		42.9	0.410	5.500	3–65
	14.75	0.352	3.452	3–60		50	0.558	5.648	3–65
	17.25	0.475	3.575	3–60		55	0.656	5.746	3–65
7	15.3	0.250	3.660	3–60		60.8	0.590	6.000	3–65
	17.5	0.353	3.763	3–60		70	0.784	6.194	3–65
	20	0.458	3.868	3–60		81.3	0.810	6.400	3–70
8	18.4	0.270	4.000	3–60	**18**	46	0.380	6.000	3–65
	20.5	0.357	4.087	3–60		54.7	0.460	6.000	3–65
	23	0.449	4.179	3–60		65	0.637	6.177	3–70
	25.5	0.541	4.271	3–60		70	0.719	6.259	3–70
9	21.8	0.290	4.330	3–60	**20**	65.4	0.500	6.250	3–65
	25	0.406	4.446	3–60		81.4	0.600	7.000	3–70
	30	0.569	4.609	3–60	**24**	71	0.480	7.000	3–65
	35	0.732	4.772	3–60		79.9	0.500	7.000	3–65
10	22	0.250	5.000	3–60		100	0.754	7.254	3–70
	25.4	0.310	4.660	3–60		105.9	0.625	7.875	3–70
	30	0.455	4.805	3–60		115	0.750	8.000	3–65

Bethlehem I Beams

Manufacturers' Standard Specifications

Size in Inches	Weight per Ft. Lbs.	Thickness of Web	Width of Flange	Stock Lengths Ft.	Size in Inches	Weight per Ft. Lbs.	Thickness of Web	Width of Flange	Stock Lengths Ft.
10	23.5	.250	5.85	3–60	**18**	49.0	.320	7.50	3–60
12	28.5	.250	6.12	3–60	**20**	59.5	.375	8.00	3–70
12	36.5	.31	6.30	3–60	**24**	73.5	.390	9.00	3–70
15	38.5	.290	6.66	3–60					

Channels—Bar Sizes

Mild Steel

Size in Inches	Weight per Ft. Lbs.	Stock Lengths Ft.	Size in Inches	Weight per Ft. Lbs.	Stock Lengths Ft.
1/2x 1/4x 1/8	.28	20	1 1/4x 1/2x 1/8	.99	20, 25
5/8x 5/16x 1/8	.41	20, 25	1 1/2x 1/2x 1/8	1.12	20, 25
3/4x 5/16x 3/32	.40	18, 20, 25, 30	1 1/2x 9/16x 1/4	1.68	20, 25
3/4x 11/32x 3/32	.40	18, 20, 25	1 1/2x 3/4x 1/8	1.17	20, 25
3/4x 3/8x 1/8	.56	20, 25	1 1/2x1 1/2x 3/16	2.63	20, 25
7/8x 3/8x 1/8	.61	18, 30	2 x 9/16x 3/16	1.86	20, 25
7/8x 7/16x 1/8	.69	20, 25	2 x 5/8x 1/4	2.28	20, 25
1 x 3/8x 1/8	.68	18, 20, 25	2 x1 x 3/16	2.32	20, 25
1 x 1/2x 1/8	.84	20, 25, 30	2 1/2x 5/8x 3/16	2.27	20, 25
1 1/8x 9/16x 3/16	1.12	20, 25			

Channels—Structural

Manufacturers' Standard Specifications

Depth Channel Inches	Weight per Ft. Lbs.	Web Inches Thick	Width Flange Inches	Stock Lengths Ft.
3	4.1	0.170	1.410	3–50
	5	0.264	1.504	3–50
	6	0.362	1.602	3–50
4	5.4	0.180	1.580	3–50
	6.25	0.252	1.652	3–50
	7.25	0.325	1.725	3–50
5	6.7	0.190	1.750	3–60
	9	0.330	1.890	3–60
	11.5	0.477	2.037	3–60
6	8.2	0.200	1.920	3–60
	10.5	0.318	2.038	3–60
	13	0.440	2.160	3–60
	15.5	0.563	2.283	3–60
7	9.8	0.210	2.090	3–60
	12.25	0.318	2.198	3–60
	14.75	0.423	2.303	3–60
	17.25	0.528	2.408	3–60
	19.75	0.633	2.513	3–60
8	11.5	0.220	2.260	3–60
	13.75	0.307	2.347	3–60
	16.25	0.399	2.439	3–60
	18.75	0.490	2.530	3–60
	21.25	0.582	2.622	3–60
9	13.4	0.230	2.430	3–60
	15	0.288	2.488	3–60
	20	0.452	2.652	3–60
	25	0.615	2.815	3–60

Depth Channel Inches	Weight per Ft. Lbs.	Web Inches Thick	Width Flange Inches	Stock Lengths Ft.
10	15.3	0.240	2.600	3–60
	20	0.382	2.742	3–60
	25	0.529	2.889	3–60
	30	0.676	3.036	3–60
	35	0.823	3.183	3–60
12	20.7	0.280	2.940	3–60
	25	0.390	3.050	3–60
	30	0.513	3.173	3–60
	35	0.636	3.296	3–60
	40	0.758	3.418	3–60
13	31.8	0.375	4.000	3–60
15	33.9	0.400	3.400	3–60
	40	0.524	3.524	3–60
	45	0.622	3.622	3–60
	50	0.720	3.720	3–60
	55	0.818	3.818	3–60

SHIP AND CAR CHANNELS

Depth Channel Inches	Weight per Ft. Lbs.	Web Inches Thick	Width Flange Inches	Stock Lengths
6	15.3	.34	3.5	60
10	21.7	.375	3.375	60
†13	50.0	.787	4.412	60

Angles—Bar Sizes

Mild Steel

Size in Inches	Weight per Ft. Lbs.	Stock Lengths Ft.
½x ½x ⅛	.38	20, 22
⅝x ⅝x ⅛	.48	20, 22
¾x ¾x ⅛	.59	20, 22
⅞x ⅞x ⅛	.70	20, 22
1 x ⅝x ⅛	.64	20, 22
1 x1 x ⅛	.80	20, 22, 30
3/16	1.16	20, 22, 30
¼	1.49	20, 22, 30
1¼x1¼x ⅛	1.01	20, 22, 30
3/16	1.48	20, 22, 30
¼	1.92	20, 22, 30
1⅜x ⅞x ⅛	.91	20, 22
1½x1½x ⅛	1.23	20, 22, 30
3/16	1.80	20, 22, 30
¼	2.34	20, 22, 30
5/16	2.86	20, 22, 30
⅜	3.35	20, 22, 30
1¾x1¾x ⅛	1.44	20, 22
3/16	2.12	20, 22, 30
¼	2.77	20, 22, 30
5/16	3.39	20, 22, 30
2 x1½x ⅛	1.44	20, 22

Size in Inches	Weight per Ft. Lbs.	Stock Lengths Ft.
2 x1½x 3/16	2.12	20, 22, 30, 40
¼	2.77	20, 22, 30
2 x2 x ⅛	1.65	20, 22, 30
3/16	2.44	20, 22, 30, 40
¼	3.19	20, 22, 30, 40
5/16	3.92	20, 22, 30, 40
⅜	4.70	20, 22, 30, 40
2¼x2¼x ⅛	1.86	20, 22, 30
3/16	2.75	40
¼	3.62	20, 22, 30, 40
5/16	4.50	20, 22, 30, 40
2½x2 x 3/16	2.75	20, 22, 30, 40
¼	3.62	20, 22, 30, 40
5/16	4.50	20, 22, 30, 40
⅜	5.30	3–40
2½x2½x ⅛	2.08	20, 22, 30, 40
3/16	3.07	20, 22, 30, 40
¼	4.10	20, 22, 30, 40
5/16	5.00	20, 22, 30, 40
⅜	5.90	20, 22, 30, 40
3 x2 x 3/16	3.07	3–60
3 x3 x ⅛	2.50	20, 30
3/16	3.71	20, 30, 40

Angles 2″x2″x 3/16″ and larger, cut to lengths 3 ft. and over, no charge.

Galvanized Angles

Size in Inches	Approximate Wt. per Ft. in Lbs.	Stock Lengths Ft.
¾x ¾x ⅛	.62	20, 22
1 x1 x ⅛	.84	20, 22
3/16	1.22	20, 22
1¼x1¼x ⅛	1.06	20, 22
3/16	1.55	20, 22
1½x1½x ⅛	1.29	20, 22
3/16	1.89	20, 22

Size in Inches	Approximate Wt. per Ft. in Lbs.	Stock Lengths Ft.
1½x1½x ¼	2.46	20, 22
1¾x1¾x 3/16	2.23	20, 22
2 x2 x ⅛	1.73	20, 22
3/16	2.56	20, 22
¼	3.35	20, 22
2½x2½x ⅛	2.18	20, 22
3/16	3.22	20, 22

Angles—Structural

Manufacturers' Standard Specifications

Size in Inches	Weight per Ft. Lbs.	Stock Lengths Ft.
3 x2 x¼	4.1	3-60
5/16	5.0	3-60
⅜	5.9	3-60
3 x2½x¼	4.5	3-60
5/16	5.6	3-60
⅜	6.6	3-60
3 x3 x⅛	2.5	
3/16	3.71	
¼	4.9	3-60
5/16	6.1	3-60
⅜	7.2	3-60
7/16	8.3	3-60
½	9.4	3-60
⅝	11.5	3-60
3½x2½x¼	4.9	3-60
5/16	6.1	3-60
⅜	7.2	3-60
½	9.4	3-60
⅝	11.5	3-60
3½x3 x5/16	6.6	3-60
⅜	7.9	3-60
½	10.2	3-60
3½x3½x¼	5.8	3-60
5/16	7.2	3-60
⅜	8.5	3-60
7/16	9.8	3-60
½	11.1	3-60
⅝	13.6	3-60
4 x3 x¼	5.8	3-60
5/16	7.2	3-60
⅜	8.5	3-60
7/16	9.8	3-60
½	11.1	3-60
4 x3½x⅜	9.1	3-60
4 x4 x¼	6.6	3-60
5/16	8.2	3-60
⅜	9.8	3-60
7/16	11.3	3-60
½	12.8	3-60
4 x4 x⅝	15.7	3-60
¾	18.5	3-60
4½x3 x⅜	9.1	3-60
5 x3 x5/16	8.2	3-60
⅜	9.8	3-60
½	12.8	3-60
5 x3½x5/16	8.7	3-60
⅜	10.4	3-60
7/16	12.0	3-60
½	13.6	3-60
⅝	16.8	3-60
5 x4 x⅜	11.0	3-60
½	14.5	3-60
5 x5 x⅜	12.3	3-60
½	16.2	3-60
⅝	20.0	3-60
6 x3½x⅜	11.7	3-60
7/16	13.5	3-60
½	15.3	3-60
⅝	18.9	3-60
6 x4 x5/16	10.4	3-60
⅜	12.3	3-60
7/16	14.3	3-60
½	16.2	3-60
9/16	18.1	3-60
⅝	20.0	3-70
¾	23.6	3-70
6 x6 x⅜	14.9	3-60
7/16	17.2	3-60
½	19.6	3-60
9/16	21.9	3-60
⅝	24.2	3-60
¾	28.7	3-70
⅞	33.1	3-70
7 x3½x½	17.0	3-60
8 x6 x¾	33.8	3-70
8 x8 x½	26.4	3-60
¾	38.9	3-60

Weights of Various Substances

Per Cubic Foot

Names of Substances	Aver. Weight Lbs.
Anthracite, solid, of Pennsylvania	93
Anthracite, broken, loose	54
Anthracite, broken, moderately shaken	58
Anthracite, heaped, bushel, loose	80
Ash, American white, dry	38
Asphaltum	87
Brass (Copper and Zinc) cast	504
Brass, rolled	524
Brick, best pressed	150
Brick, common, hard	125
Brick, soft, inferior	100
Brickwork, pressed brick	140
Brickwork, ordinary	112
Cement, hydraulic ground, loose, American, Rosendale	56
Cement, hydraulic ground, loose, American, Louisville	50
Cement, hydraulic ground, loose, English, Portland	90
Cherry, dry	42
Chestnut, dry	41
Coal, bituminous, solid	84
Coal, bituminous, broken, loose	49
Coal, bituminous, heaped bushel, loose	74
Coke, loose, of good coal	27
Coke, loose, heaped bushel	38
Copper, cast	542
Copper, rolled	548
Earth, common loam, dry, loose	76
Earth, common loam, dry, moderately rammed	95
Earth, as a soft flowing mud	108
Ebony, dry	76
Elm, dry	35
Flint	162
Glass, common window	157
Gneiss, common	168
Gold, cast, pure, or 24 carat	1,204
Gold, pure hammered	1,217
Granite	170
Gravel, about the same as sand, which see.	
Hemlock, dry	25
Hickory, dry	53
Hornblende, black	203
Ice	58.7
Iron, cast	450
Iron, wrought, purest	485
Iron, wrought, average	480
Ivory	114
Lead	711
Lignum Vitae, dry	83
Lime, quick ground, loose, or in small lumps	53
Lime, quick ground, loose, thoroughly shaken	75
Lime, quick ground, loose, per struck bushel	66

Names of Substances	Aver. Weight Lbs.
Limestones and Marbles	168
Limestones and Marbles, loose, in irregular fragments	96
Mahogany, Spanish, dry	53
Mahogany, Honduras, dry	35
Maple, dry	49
Marbles, see Limestones.	
Masonry, of granite or limestone, well dressed	165
Masonry, of mortar rubble	154
Masonry, of dry rubble, well scabbed	138
Masonry, of sandstone, well dressed	144
Mercury, at 32° Fahrenheit	849
Mica	183
Mortar, hardened	103
Mud, dry, close	80 to 110
Mud, wet, fluid, maximum	120
Oak, live, dry	59
Oak, white, dry	52
Oak, other kinds	32 to 45
Petroleum	55
Pine, white, dry	25
Pine, yellow, Northern	34
Pine, yellow, Southern	45
Platinum	1,342
Quartz, common, pure	165
Rosin	69
Salt, coarse, Syracuse, N. Y.	45
Salt, Liverpool, fine for table use	49
Sand, of pure quartz, dry, loose	90 to 106
Sand, well shaken	99 to 117
Sand, perfectly wet	120 to 140
Sandstones, fit for building	151
Shales, red or black	162
Silver	651
Slate	175
Snow, freshly fallen	5 to12
Snow, moistened and compacted by rain	15 to 50
Spruce, dry	25
Steel	490
Sulphur	125
Sycamore, dry	37
Tar	62
Tin, cast	459
Turf or Peat, dry, unpressed	20 to 30
Walnut, black, dry	38
Water, pure rain or distilled, at 60° Fahrenheit	62⅓
Water, sea	64
Wax, bees'	60½
Zinc or Spelter	437

Green timbers usually weigh from one-fifth to one-half more than dry.

Weight of Round and Square Steel

Per Lineal Foot

Size in Inches	Round	Square	Size in Inches	Round	Square	Size in Inches	Round	Square
0 1/32	.0026	.0033	2	10.68	13.60	4	42.73	54.40
0 1/16	.0104	.0133	2 1/16	11.36	14.46	4 1/16	44.07	56.11
0 1/8	.0417	.0531	2 1/8	12.06	15.35	4 1/8	45.44	57.85
0 3/16	.0938	.1195	2 3/16	12.78	16.27	4 3/16	46.83	59.62
0 1/4	.1669	.2123	2 1/4	13.52	17.22	4 1/4	48.24	61.41
0 5/16	.2608	.3333	2 5/16	14.28	18.19	4 5/16	49.66	63.23
0 3/8	.3756	.4782	2 3/8	15.07	19.18	4 3/8	51.11	65.08
0 7/16	.5111	.6508	2 7/16	15.86	20.20	4 7/16	52.58	66.95
0 1/2	.6676	.8500	2 1/2	16.69	21.25	4 1/2	54.07	68.85
0 9/16	.8449	1.076	2 9/16	17.53	22.33	4 9/16	55.59	70.78
0 5/8	1.043	1.328	2 5/8	18.40	23.43	4 5/8	57.12	72.73
0 11/16	1.262	1.608	2 11/16	19.29	24.56	4 11/16	58.67	74.70
0 3/4	1.502	1.913	2 3/4	20.20	25.00	4 3/4	60.25	76.71
0 13/16	1.763	2.245	2 13/16	21.12	26.90	4 13/16	61.84	78.74
0 7/8	2.044	2.603	2 7/8	22.07	28.10	4 7/8	63.46	80.81
0 15/16	2.347	2.989	2 15/16	23.04	29.34	4 15/16	65.10	82.89
1	2.670	3.400	3	24.03	30.60	5	66.76	85.00
1 1/16	3.014	3.838	3 1/16	25.04	31.89	5 1/16	68.44	87.14
1 1/8	3.379	4.303	3 1/8	26.08	33.20	5 1/8	70.14	89.30
1 3/16	3.766	4.795	3 3/16	27.13	34.55	5 3/16	71.86	91.49
1 1/4	4.173	5.312	3 1/4	28.20	35.92	5 1/4	73.60	93.72
1 5/16	4.600	5.857	3 5/16	29.30	37.31	5 5/16	75.37	95.96
1 3/8	5.019	6.428	3 3/8	30.42	38.73	5 3/8	77.15	98.23
1 7/16	5.518	7.026	3 7/16	31.56	40.18	5 7/16	78.95	100.5
1 1/2	6.008	7.650	3 1/2	32.71	41.65	5 1/2	80.77	102.8
1 9/16	6.520	8.301	3 9/16	33.90	43.14	5 9/16	82.62	105.2
1 5/8	7.051	8.978	3 5/8	35.09	44.68	5 5/8	84.49	107.6
1 11/16	7.604	9.682	3 11/16	36.31	46.24	5 11/16	86.38	110.0
1 3/4	8.178	10.41	3 3/4	37.56	47.82	5 3/4	88.29	112.4
1 13/16	8.773	11.17	3 13/16	38.81	49.42	5 13/16	90.22	114.9
1 7/8	9.388	11.95	3 7/8	40.10	51.05	5 7/8	92.17	117.4
1 15/16	10.02	12.76	3 15/16	41.40	52.71	5 15/16	94.14	119.9
						6	96.14	122.4

These figures represent the theoretical weights of steel. Iron will run about 2 per cent lighter.

Useful Information

To Find

The circumference of a circle multiply diameter by 3.1416.

The diameter of a circle multiply circumference by .31831.

The area of a circle multiply square of diameter by .7854.

The area of a triangle multiply base by ½ perpendicular height.

The surface of a ball multiply square of diameter by 3.1416.

The solidity of a sphere multiply cube of diameter by .5236.

The side of an equal square multiply diameter by .8862.

The cubic inches in a ball multiply cube of diameter by .5236.

The cubic contents of a cone, multiply area of base by ⅓ the altitude.

Doubling the diameter of a pipe increases its capacity 4 times.

A gallon of water (U. S. standard) weighs 8⅓ lbs. and contains 231 cubic inches.

A cubic foot of water contains 7½ gallons, 1728 cubic inches, and weighs 62½ lbs.

To find the pressure in pounds per square inch of a column of water multiply the height of the column in feet by .434.

Steam rising from water at its boiling point (212 degrees) has a pressure equal to the atmosphere (14.7 lbs. to the square inch.)

A standard horse power: The evaporation of 30 lbs. of water per hour from a feed water temperature of 100° F. into steam at 70 lbs. gauge pressure.

To find capacity of tanks any size: given dimensions of a cylinder in inches, to find its capacity in U. S. gallons; square the diameter, multiply by the length and by .0034.

To ascertain heating surface in tubular boilers multiply ⅔ the circumference of boiler by length of boiler in inches and add to it the area of all the tubes.

The maximum allowable working pressure on the shell of a boiler or drum shall be determined by the strength of the weakest course computed from the thickness of the plate, the tensile strength stamped thereon, the efficiency of the longitudinal joint, or the ligament between the tube holes in shell or drum (whichever is the least), the inside diameter of the course and the factor of the safety.

TSxtxE
RxFS
=maximum allowable working pressure, lb. per sq. in.
Where

TS=ultimate tensile strength stamped on shell plates, lb. per sq. in.

t=minimum thickness of shell plates in weakest course, in.

E=efficiency of longitudinal joint or of ligaments between tube holes (whichever is the least).

R=inside radius of the weakest course of the shell or drum, in.

FS=factor of safety, or the ratio of the ultimate strength of the material to the allowable stress. For new constructions FS in the above formula = 5.

The Effect of Heat on Various Substances

Melting Point		Melting Point		Boiling Point	
Antimony	1,166†	Platinum	3,191†	Mercury	662†
Bismuth	520†	Silver	1,761†	Naphtha	186†
Brass	1,600-1,900†	Steel	2,500†	Fresh Water	212†
Copper	1,982†	Tin	450†	Sea Water	213.2†
Glass	2,300†	Zinc	787†	Ether	100†
Gold	1,946†	Ice	32†	Oil Turpentine	304†
Cast Iron	3,279†			Linseed Oil	640†
Lead	622†			Sweet Oil	412†

Melting Temperature of Alloys

Lead 3, Tin 5, Bismuth 8	208†
Lead 1, Tin 3, Bismuth 5	212†
Lead 1, Tin 4, Bismuth 5	240†
Tin 1, Bismuth 1	286†
Lead 2, Tin 3	334†
Tin 2, Bismuth 1	336†
Lead 1, Tin 2	360†
Tin 8, Bismuth 1	392†
Lead 2, Tin 1	475†

Proportions of Various Compositions in Common Use

(In 100 Parts)

Babbitt's Metal	Tin 89, Copper 3.7, Antimony 7.3.
Fine Yellow Brass	Copper 66, Zinc 34.
Gun Metal, Valves, etc	Copper 90, Tin 10.
White Brass	Copper 10, Zinc 80, Tin 10.
German Silver	Copper 33.3, Zinc 33.4, Nickel 33.3.
Church Bells	Copper 80, Zinc 5.6, Tin 10.1, Lead 4.3.
Gongs	Copper 81.6, Tin 18.4.
Lathe Bushes	Copper 80, Tin 20.
Machinery Bearings	Copper 87.5, Tin 12.5.
Muntz Metal	Copper 60, Zinc 40.
Sheathing Metal	Copper 56, Zinc 44 .

Shrinkage of Castings

In locomotive cylinders is $\frac{1}{16}$-inch in a foot.

Pipes is $\frac{1}{8}$-inch in a foot.

Girders, beams, etc., is $\frac{1}{8}$-inch in 15 inches.

Engine beams, connecting rods, etc., is $\frac{1}{8}$-inch in 16 inches.

Large cylinders, say 70-inch diameter, 10-ft. stroke, the contraction of diameter is $\frac{3}{8}$-inch at top, $\frac{1}{2}$-inch at bottom, and $\frac{1}{8}$-inch in 16 inches in length.

Thin brass is $\frac{1}{8}$-inch in 9 inches.

Thick brass is $\frac{1}{8}$-inch in 10 inches.

Zinc is $\frac{5}{16}$ inch in a foot.

Lead is $\frac{5}{16}$-inch in a foot.

Copper is $\frac{3}{16}$-inch in a foot.

Bismuth is $\frac{5}{32}$-inch in a foot.

Tin is $\frac{1}{4}$-inch in a foot.

During the Summer months, when fires are low or completely out, is the time to put your plant in condition for another season. Our stocks of the following are complete and immediately available to you:

Arches, Cast Iron
" Tile
Blow-off Catch Basins
" Valves
Boilers, Fire-box
" Heating
" Hot Water
" Portable
" Power
" Vertical
Boiler Braces
" Flanges
" Heads
" Lugs
" Patch Bolts
" Rivets
" Tubes

Breechings
Copper Ferrules
Fire Tools
Feed Water Heaters
Flange Steel
Flue Welding
Fusible Plugs
Garbage Burner
Grates
Grease Extractor
Guy Wire
Handhole Plate
Handhole Crabs
Manhole Plates
Manhole Crabs
Refuse Burners
Return Ribs
Sheet Steel and Plates

Smokestack Netting
Stacks, Guyed
" Self-Supporting
Staybolts
Steam Receivers
Steel Truck Bodies
Tanks, Air Storage
" with Coils
" Elevator Boot
" Hydro-Pneumatic
" Oil Storage
" Pressure
" Septic
" Sprinkler
" Water Storage
Tank Heads
" Steel
Welding

We will gladly examine your plant without charge and furnish estimate on any needed repairs. Our personnel of trained men with years of experience is at your service for

Relining Steel Furnaces
Resetting Boilers
Rebricking Boilers

Steel Erection and Setting
Acetylene Cutting and Welding
Repair Work of Any Nature

ANY BOILER ***ANY TIME*** ***ANY PLACE***

KENNY BOILER AND MANUFACTURING CO.

Saint Paul, Minnesota

Boilers, Tanks
Stacks

Heating and Power
Plant Accessories